Climate Change Communications: understanding people's perceptions and evaluating the effectiveness of interventions

Thomas Andrew White BSc (Hons) MA

Submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy

Institute of Energy and Sustainable Development
De Montfort University, Leicester

June 2011.

Abstract

A government-funded scheme, the UK Climate Change Communications Initiative (UKCCCI), provided money for organisations to deliver projects that attempted to impact positively on people's attitudes towards climate change and to increase knowledge and awareness of the issue. This devolution of communications is a relatively novel approach after previous centralised campaigns. This thesis adopts a mixed-method approach; a qualitative and a quantitative study have been conducted based on three case studies of individual projects funded under the UKCCCI. The quantitative study analyses pre- and post-project surveys to assess whether the communications produced the desired changes in attitude, knowledge and awareness; results are generally mixed in relation to all three case studies as some statistics are more positive after communications, whereas some are less positive. Data from a regional UKCCCI project are compared with a nationally representative dataset; this analysis shows that attitudes, knowledge and awareness differ at regional and national scales, supporting the policy of devolving communications. Regional data are also analysed to see if there are differences between socio-demographic groups within a single target audience for communications; this analysis suggests that interventions must strike a balance between personalisation of information and the higher cost of targeting smaller groups with more specific material. The quantitative study uses conceptual content cognitive mapping (3CM) to discover the climate change-related knowledge of twenty subjects who received communications from two of the case study projects. Results suggest that people have knowledge of a wide range of issues related to climate change, but they do not possess a detailed scientific understanding. However, there is a high knowledge of how to mitigate climate change and this is expressed largely through individual actions and lifestyle choices. A template analysis was also conducted to discover what interviewees thought specifically about the communications and a range of practical recommendations are made for future projects. Implications are discussed in relation to future practical climate change communications projects, wider policy and academic research.

Keywords: Attitudes, knowledge, attitude change, climate change, behaviour, communications, conceptual content cognitive mapping

Acknowledgements

There are many people to thank for their help and kindness throughout this project. The Institute of Energy and Sustainable Development at De Montfort University was a great place to study and it provided a stimulating environment in which to carry out research, so thanks go to all the staff and other research students. My two first supervisors, Dr Katherine Irvine and Dr Rob Wall, were tremendously helpful and knowledgeable and gave me lots of great advice. I couldn't have completed the work without their help and thank them greatly. The assistance of my second supervisors Dr Simon Taylor and Professor Paul Fleming was also invaluable and much appreciated.

The work involved the evaluation of three case study projects, so thanks go to the Woodcraft Folk, the Nottinghamshire and Derbyshire Local Authorities Energy Partnership and the Wellingborough Partnership. They all helped a huge amount with the data collection and it is hoped that they also benefitted from working in partnership. The study could not have been completed without the willingness of all the people who took part in the research and I am grateful that they gave their time. The Engineering and Physical Sciences Research Council provided a bursary, without which I would not have been able to survive.

Most of all, I'd like to thank my mum and dad for everything they have done for me over the years and for making me the person I am today. Their love, advice and support have always been given without question and they are both a constant source of happiness and inspiration.

This work is dedicated to Liz, Ted and baby number two. I look forward to spending the rest of my life with you all.

Glossary

3CM – Conceptual Content Cognitive Map

ANOVA – Analysis of Variance

BCW – Borough Council of Wellingborough

BotB – Battle of the Bands

CAT – Centre for Alternative Technology

CC – Climate change

CCF –Climate Challenge Fund

CFC – Chlorofluorocarbon

CHEAKS – Children's Environmental Attitude and Knowledge Scale

CO_2 – Carbon dioxide

COI – Central Office of Information

DECC – Department of Energy and Climate Change

Defra – Department of Environment, Food and Rural Affairs

DfT – Department for Transport

DMU – De Montfort University

ESB – Environmentally significant behaviour

ET – Everybody's talking about climate change

FYE – 'Face your elephant'

GHE – Greenhouse Effect

GHG – Greenhouse Gas

GLA – Greater London Assembly

IAPS – International Association of People-Environment Studies

IESD – Institute of Energy and Sustainable Development

IPCC – Intergovernmental Panel on Climate Change

IPPR – Institute for Public Policy Research

K-S – Kolmogorov-Smirnov

LA – Local Authority

LAEP – Local Authorities Energy Partnership

LSP – Local Strategic Partnership

N&D – Nottinghamshire & Derbyshire

NEP – New Environmental Paradigm

TIB – Theory of Interpersonal Behaviour

TPB – Theory of Planned Behaviour

UKCCCI – UK Climate Change Communications Initiative

UNCED – United Nations Conference on Environment and Development

UNFCCC – United Nations Framework Convention on Climate Change

VBN – Value-Belief-Norm Theory

WF – Woodcraft Folk

WoK – Web of Knowledge

WT – Wellingborough Toolkit

Contents

1. Introduction

1.1 Climate change

The greenhouse effect is a natural phenomenon that keeps Earth's atmosphere warmer than it would otherwise be by trapping outgoing radiation. Climate change is caused by the enhancement of the natural greenhouse effect due to human activity. Greenhouse gases (GHGs) are released into the atmosphere due to humankind's desire for goods and services such as heating, power and motorised transport. For example, the most prevalent greenhouse gas emitted from human activity, carbon dioxide, is released when fossil fuels such as coal or oil are burnt in central heating systems to warm houses. These 'extra' greenhouse gases, which would otherwise remain in different chemical forms, are released and remain within the Earth's atmosphere absorbing a greater amount of outgoing radiation and leading to an overall warming of the planet. This manifests itself in varying changes in climate in different parts of the world, which in turn precipitate global and local physical impacts, examples of which include increased average temperatures, rising sea levels and changing weather patterns. Such physical impacts are likely to cause social and economic impacts, ranging from a greater need for cooling systems in offices and homes to an increased likelihood of war and famine (IPCC, 2007).

There appears to be scientific consensus that climate change is happening and an understanding of the need to reduce emissions of greenhouse gases (Henson, 2006; Lorenzoni et at, 2007; IPCC, 2007). Emissions reductions could help prevent dangerous damage to the Earth's natural climate support functions and reduce the negative impacts on human and natural systems. According to IPCC (Ibid.), the amount of greenhouse gases already released means that some climate change is unavoidable. Therefore, at the same time as a need for mitigating future climate change by reducing emissions has been identified, there is also a need for society to adapt to the changes that are anticipated.

1.2 Climate change policy

Climate change operates on a global scale, as emissions released in any one location contribute in equal measure to global climate change. Climate change is therefore different to some other emissions-related environmental problems as impacts are not felt local to causes. Addressing climate change therefore requires global co-operation and there has been international policy developments since climate change was first recognised as a phenomenon in the 1980s. The United Nations Framework Convention on Climate Change (UNFCCC), which formalises international action to reduce GHG emissions, was signed and agreed at the UN Conference on Environment and Development (UNCED) at Rio de Janeiro in 1992. This led to the Kyoto Protocol in 1997, which was ratified in 2005 when a sufficient number of countries signed up and made the

reduction of global CO_2 emissions legally binding (Ibid.). As a member of the European Union (EU), the UK has signed up to the Protocol and, as such, must develop its own plans to reduce its emissions of a basket of six greenhouse gases; the Department of Environment, Food and Rural Affairs (Defra, 2005) noted that, in 2003, CO_2 accounted for 86% of UK greenhouse gas emissions, which shows the importance of this particular gas. The Protocol is designed to operate at various political scales, with individual countries being responsible for defining their own reduction measures. This may involve further devolution of strategy to lower levels of governance, such as regional bodies or Local Authorities, which in the UK, under the auspices of the 2000 Local Government Act, have a duty to promote the economic, social and environmental well-being of their district.

The UK Climate Change Act 2008 sets legally binding targets in relation to emissions reductions (DECC, 2009). Under the auspices of the Act, the Government has set itself several targets across different sectors, each operating over a specified period of time. Firstly, a 34% reduction in CO_2 emissions is required by 2020 (compared with 1990 levels), with a carbon budgeting system that caps emissions over five-year periods (Ibid). The Kyoto target is a 12.5% reduction by 2008-12, but the UK has adopted a more stringent, self-defined target. There is also an 80% reduction target by 2050, which, according to current scientific consensus (IPCC, 2007) is necessary to ensure a stable future global temperature with acceptable conditions for human life (Ibid.). Therefore, the government has defined a problem, established a baseline (1990 levels) and given itself a measurable target. However, the nature of the climate change problem is a difficult one in terms of policy. The timeframe of cause and effect is lengthy and much longer than the usual short-term policies issued by governments (in the UK, government elections are held less than every five years). The serious nature of climate change and the massive extent of past emissions mean that action must be taken now if the most serious impacts of climate change are to be avoided. The growing consensus of agreement about tackling climate change is illustrated by recent developments in the political sphere and the passing through parliament of the Climate Change Act (DECC, 2009). This should at least ensure present policy is not undermined by possible future changes in the elected government and allows a degree of futurity in governmental climate initiatives.

Governments have a wide range of policy options for reducing greenhouse gas emissions, including: regulatory changes (e.g. placing a tax on carbon and charging individuals for how much they emit); monetary support for renewable energy and energy-efficiency (e.g. a grant scheme to assist homeowners with the cost for insulating their attics; economic incentives (e.g. carbon-emission trading) (Stern, 2007); and attempting to alter the behaviour of individuals (e.g. an

advertising campaign to tell people what to do to reduce their own, personal emissions). All four mechanisms are capable of producing a reduction in emissions, but it is the latter approach that is considered in this thesis. A single individual reducing their carbon dioxide emissions would have very little impact on mitigating global climate change. However, many individuals acting together would add up to a significant reduction. If every single person in the UK reduced their own personal emissions by 1 tonne per year, there would be a cumulative reduction of over 60 million tonnes.

1.3 Influencing people's perceptions of climate change

1.3.1 Rationale for thesis

The overarching aim of this thesis is to identify how communications can be designed to impact effectively on perceptions of climate change, by studying what people's perceptions are currently and evaluating three case studies of projects that attempt to change perceptions. This aim has both an academic and a practical relevance: there are few academic studies of UK-based climate change communications (Moser & Dilling, 2007) describing how to design effective strategies; and future communications projects will benefit from advice on what works practically, which in turn will assist in attempts to mitigate climate change.

As noted above the study also considers what perceptions people currently have. Previous studies have identified a very high general awareness of the issue, including causes and consequences of climate change and a concern about potential impacts (Defra, 2002; Lorenzoni et al, 2007); indeed just 1% of the population of England have not heard of 'climate change', 'global warming' or 'the greenhouse effect' (Ibid.). However, when compared to other issues such as health, personal finance or family matters and even other environmental issues such as air or water pollution, climate change is often seen as lower priority for individuals (Lorenzoni & Hulme, 2009; Poortinga & Pidgeon, 2003).

The UK governmental project from which the case studies were drawn was called the UK Climate Change Communications Initiative (UKCCCI), and is described below. The research chose three case studies from the UKCCCI, each of which attempted to influence perceptions through different communications strategies. Data were collected to find out what perceptions individuals currently have about climate change, and how this may help with the design of interventions to change these perceptions. Further data were collected to identify if the case study communications projects had actually influenced peoples' perceptions of climate change and to learn from these insights.

1.3.2 Climate change communications

Given the need to influence climate change-related perceptions and behaviours noted above, there has been a recent increase in interest regarding climate change communications methods (Moser & Dilling, 2007; Spence & Pidgeon, 2010). Examples of recent studies include Moser (2007), who posits that appealing to individuals' fears about the impacts of climate change should not be used as the sole basis for a communications strategy. Framing communications around fear can be useful if other factors are favourable such as low costs of behavioural responses and self-efficacy. Spence & Pidgeon (2010) also considered a particular aspect of climate change communications: whether framing climate change mitigation actions as 'gains or losses' or 'local or distant' is the best methodology. They discovered that attitude change "may be effectively promoted by discussing the gains produced through climate change mitigation and by focusing individuals on the social impacts" (Ibid., 664). Whitmarsh (2009a) argues that the public perceive the terms "global warming" and "climate change" differently, and that communications that provide information about the former may evoke a higher response than information about the latter.

Amongst further research discussed in the literature review, it is the insights noted above that this study explores, to identify whether methods that are recommended on one context are also useful in other contexts. However, there has not been a vast amount of empirical evidence collected specifically for the purpose of identifying the most appropriate communications methodologies (Spence & Pidgeon, 2010) and this is the justification for this thesis and its key contribution to knowledge.

1.3.3 Perceptions and behaviour

This thesis looks in detail at how to alter individuals' perceptions of climate change so that they are more likely to reduce the amount of carbon emissions they are responsible for. Climate-related behaviour is influenced by a wide range of variables, which are explored in more detail in the second chapter of this thesis, such as perceptions (or 'attitudinal factors'), contextual forces, personal capabilities and habits (Stern, 2000a) and each of the variables contribute to different extents depending on the behaviour in question and the time (Gardner & Stern, 1996; Stern, 2000b). The study presented here looks specifically at one of the variables noted above: perceptions, which includes several variables such as norms, knowledge, efficacy, beliefs and values. The thesis does not focus on how to change climate-related behaviour. Rather, its focus is how communications can be used to alter people's perceptions, which in turn may result in behavioural change. However, environmental psychology is an important area of literature for this subject matter given its focus on and development of 'attitudes' as a construct (Ajzen, 1991) and is considered as one of the key areas of literature in which the research is framed. An aim of this

thesis is to integrate the literature from this field with studies that attempt to understand climate change perceptions and those that evaluate environmental communications strategies.

The purpose of the UKCCCI was to provide "financial support for communications projects seeking to achieve positive changes in public *attitudes* about climate change" (Defra 2006a, emphasis added). It is very important to point out at this stage that it was evident from the literature (Futerra, 2005a,b) and rhetoric (Defra, 2006a,b) associated with the UKCCCI that 'attitudes' had a much broader definition than they do in the academic literature. In Ajzen's (1991) Theory of Planned Behaviour, attitudes are defined as "a learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object" (Fishbein & Ajzen, 1975, 6). However, the UKCCCI attempted to influence not only attitudes, but also knowledge and awareness (Defra, 2006c). It was also evident from the surveys that Defra conducted to track 'public attitudes towards climate change' (COI, 2006) that awareness and knowledge were also being tracked throughout the initiative, as questions were included in the surveys that addressed these variables. As noted previously, Stern (2000a) highlights a range of psychological factors that impact on environmentally significant behaviour (ESB). It was obvious that even though the UKCCCI literature mentioned attitudes, it was actually attempting to influence a wide range of perceptions. Consequently, projects funded under the UKCCCI were ideal to address the overarching aims of this research.

The link between attitudes and behaviour is the subject of much debate in the academic literature (Kollmuss & Agyeman, 2002). There is also much interest in the attitude-behaviour link from a practical and policy perspective; people need to know whether influencing attitudinal variables as part of a behaviour change intervention is going to work in the real world. These concerns were addressed in the literature associated with the UKCCCI (Futerra, 2005a), which stated categorically that the initiative was designed specifically to influence attitudinal factors and it was unlikely to have any direct impact on specific public behaviours (Ibid.). The approach to climate change mitigation adopted in the UKCCCI was different to previous government-funded climate change interventions and came after some criticism of a previous government campaign that attempted to influence climate-change-related behaviour. The Government's 'Are you doing your bit?' campaign adopted an information-deficit (Bulkeley, 2000) model of communications and expected behaviour to change following the supply of climate change-related information to the public (Collins et al, 2003). The authors point out that the campaign cost £28.4 million over two and a half years but "awareness created by the campaign was not translated into action [because] it did not address issues of price and convenience [or] take into account the shortcomings of information-based advertising" (Ibid., 31). The reason for the failure of the campaign is because behaviour is influenced by factors other than knowledge about an issue (Kollmuss & Agyeman, 2002; Stern, 2000a).

1.3.4 Summary

The main thrust of this thesis is a discussion of how communications can be designed to impact effectively on perceptions of climate change (i.e. what works 'on the ground') and the empirical evidence collected relates specifically to this objective. In order to effectively design communications, we have to know what people currently think and know about climate change and the qualitative data collected by conceptual content cognitive mapping (3CM) explores this in detail. The objective of the 3CM research is to discover what perceptions people have about climate change and see how these insights can lead to recommendations for intervention design. Further qualitative data were collected to see what intervention participants thought specifically about the communications they had taken part in; again, this was to provide insight into appropriate methodologies. Several authors, including Whitmarsh (2008) have called for "greater use of qualitative approaches to exploring understanding [of climate change]" (Ibid., 417).

Additionally, the study collected a significant amount of quantitative data before and after the three case study projects. These data were explored in a number of ways, again with a view to providing insight into communications methodologies. Data were analysed before and after the projects to assess whether the communications techniques employed actually altered perceptions. Data from national surveys (carried out by Defra for the UKCCCI) were compared to empirical data collected for this thesis to see whether perceptions differed at national and local levels and between-group analysis was carried out with data from a single case study to see if perceptions differed. Finally, the research attempted to create a questionnaire scale that could be used as a standard tool for measuring 'climate change worldview' in future research.

The novel approach adopted by the UKCCCI of devolving climate change communications from central government to smaller scales and attempting to influence perceptions was worthy of rigorous academic research in its own right. All projects funded by Defra under the UKCCCI had to write an evaluation report, but this did not involve basing the study on previously published, peer-reviewed literature. An experimental design (as opposed to an 'action research' design) was adopted, where the researcher defined the evaluation methodology in conjunction with the organisation carrying out the communications but did not attempt to influence the communications process itself, therefore allowing the analysis to remain objective. The wider implications of the research, in terms of the effect changing perceptions is likely to have on specific climate-related behaviours, are considered but no empirical evidence was collected for this purpose. As such, the main contributions that this work makes to the academic literature are: to discover what perceptions people have about climate change; to make recommendations about how to carry out climate

change communications at both project level (i.e. by considering the success of the three case studies separately) and at wider initiative level (by analysing empirical evidence relating to the UKCCCI's policy of devolving communications); and to begin to create a scale for use in future questionnaires to define worldview in relation to climate change. In the discussion chapter, the wider implications of the study are explored in relation to existing literature and best practice for climate change communications.

1.3.5 The case study projects

This thesis is based around data collected from three case study projects, which were funded by the UK government to influence the psychological variables that contribute to climate-related behaviour. All three projects were funded by the Department of Environment, Food and Rural Affairs (Defra) through the UK Climate Change Communications Initiative (UKCCCI).

The UKCCCI included a range of central activities, such as television advertisements and a website, with the bulk of the funding being set aside for the Climate Challenge Fund (CCF), to which organisations or groups of organisations could bid to receive funding for attitude change interventions; it is from this group of projects that the three case studies were drawn. The further activities, such as the recurrent tagline and logo – "Tomorrow's Climate, Today's Challenge" - and the central website – www.climatechallenge.gov.uk - were designed to support the activities carried out under the CCF. The television advertisement explained briefly the science behind climate change, the behaviours individuals could adopt to reduce its effects and advertised the website as a source of further information. Furthermore, a 'climate change champion' was identified for each region of England. These young people took part in various activities, such as visiting a retreating glacier in Switzerland (Defra, 2006d), and were charged with the role of communicating this information back to people within their region. The UKCCCI was launched in 2006 and the projects that received funding continued their work into early 2008. The rationale behind the UKCCCI was based on a report and strategy devised by a 'sustainability communications consultancy' called Futerra (2005a).

The initiative aimed to reach a wide range of people across England, and used the CCF to allow communications projects to be tailored to different target audiences, such as localities or differing age groups. As such, the communications were devolved from central government to smaller-scale projects, organisations and communities of interest. Consequently, projects were funded at the national level (such as a project with the National Farmers Union to communicate to the nation's farmers), at the regional level (for example, a project that aimed to influence the fuel rich in

Nottinghamshire and Derbyshire) and at the local level (e.g. sponsoring a local drama group in the village of Bolsover, Derbyshire, to produce a DVD for distribution in their village) (Defra, 2006c).

The three case studies are described in detail in chapter 3 and a brief overview is supplied here. 'C-Change' targeted young people aged between 11 and 21 years using an interactive website and several discreet events that were designed to appeal to the target audience. Events included a touring information tent that attended various summer festivals (such as Glastonbury Music Festival), a Battle of the Bands competition and a Conference for school goers at the Greater London Assembly (GLA). The main communicators were a team of young volunteers that designed and carried out the communications and the key technique utilised for C-Change was peer education.

'Everybody's talking about climate change' (ET) was an awareness-raising campaign conducted to reach as many people as possible in Nottinghamshire and Derbyshire, and was run by a partnership involving all the local authorities (LAs) in the two counties: members of staff from the 19 LAs were the main communicators, including full-time and part-time staff specifically assigned to the project. ET used a range of methods to communicate with its target audience, such as: a travelling energy advice centre that attended events such as shows and farmer's markets that gave consumers advice on energy-related matters; radio advertisements; and a website. A key tool used by the ET project was a pledge form that contained a number of actions that individuals could pledge to complete to reduce their energy usage and therefore help to mitigate climate change.

'The Wellingborough Toolkit' was a small-scale project that attempted to increase the climate change-related knowledge of people in the town of Wellingborough. The project was carried out by the Borough Council of Wellingborough (BCW) and specifically targeted its own members of staff and local community groups. The main communication tool was a presentation on climate change that Energy Officers working for BCW gave to groups of interested people. This was followed by a question and answer session and handouts were given for the recipients of the communications to take home to read if they wanted to find out more. The bulk of the presentation was dedicated to describing potential impacts of climate change at the local level and identifying practical actions that individuals could use to mitigate the problem.

The case studies were chosen taking into account logistical and practical considerations. They involved organisations who were either based in the same UK region as the Institute of Energy and Sustainable Development (IESD) at De Montfort University (DMU), where the research was conducted (the East Midlands) or had an existing relationship with IESD. Additionally, the scale at

which the case studies operated (e.g. national or local) and the nature of the target audience (e.g. young people or adults) and communication style (e.g. campaign-based or events-based) were also considered so that there was a variation between projects: the Woodcraft Folk's 'C-Change' project targeted 11-21 year olds throughout the UK using peer education at a series of events as the mechanism for communications; the Nottinghamshire and Derbyshire Local Authorities Energy Partnership (LAEP) attempted to influence all the adults in its two counties using a large-scale campaign; and the Wellingborough Partnership's Toolkit targeted local community groups and staff at a single Local Authority.

1.4 Research questions, aims and objectives

The broad purpose of the thesis was to explore which factors might be significant for improving the effectiveness of climate change communications. From this, two clear aims could be identified: to explore existing perceptions of climate change; and to measure the effectiveness of communications projects. These aims led to five key objectives: to study three different practical projects of climate change communications, which utilised differing strategies; to establish what communications methodologies work practically to influence climate change-related perceptions; to find out what perceptions individuals currently have in relation to climate change; to integrate the separate sections of literature relating to environmental psychology, public understanding of climate change and climate change communications; and, based on insights from the above, to produce practical recommendations for how to more effectively influence individuals' perceptions of climate change.

A number of research questions are addressed that help to meet these objectives:

Objective 1 – Understanding perceptions of climate change

Research Question 1 How do individuals perceive climate change?

Research Question 2 Do perceptions of climate change differ at national and more local levels?

Objective 2 – Evaluating the effectiveness of climate change communications interventions

Research Question 3 Do individuals' perceptions of climate change differ after they have taken part in specific communications projects?

Research Question 4 Can value be added to communications campaigns by segmenting the target audience using socio-demographic variables?

Research Question 5 What do people, who have taken part in specific climate change communications, think about the interventions?

1.5 Outline of thesis chapters

Literature review (chapter 2)

Chapter two considers attitude-behaviour research and reviews existing literature on how people perceive climate change, as well as discussing the different constructs considered in this study, such as attitudes, knowledge and knowledge structure. The literature review also discusses the practical aspects of communications by considering studies that identify current thinking on climate change perceptions and studies that evaluate the success of attitude and behaviour change initiatives.

Methodology (chapter 3)

The methodology chapter describes the three case studies in detail including the partners involved in designing the communications, the techniques used to engage the target audience and the nature of the specific interventions. The epistemological assumptions made during the research and the ethical issues involved are also illustrated in chapter three. This is followed by a full description and justification for the data collection and analysis methodology, including a consideration of the theoretical basis for the study and also the practical limitations experienced when working with partner organisations.

Empirical chapters (chapters 4 & 5)

Chapter four considers the first two research questions highlighted above and looks at how people perceive climate change. This chapter draws on the 3CM study to evaluate what people think and know about climate change, to provide insight into what perceptions individuals have in relation to the issue. Chapter four also compares quantitative data collected in Nottinghamshire and Derbyshire to national data to see if perceptions of climate change differ at different geographical scales.

Chapter five considers the other three research questions with a view to making practical recommendations about future communications projects and initiatives. The three case studies of climate change communications are assessed quantitatively by comparing data before and after the interventions to see if perceptions have changed. Regional data are analysed to see if perceptions differ between groups within a given target audience, to identify whether target audience segmentation is an appropriate tool. Finally, qualitative data obtained from interviews with intervention participants are also analysed to see what subjects thought about the communications.

Discussion and conclusions (chapters 6 & 7)

In the discussion chapter, the results relating to all the research questions are considered in relation to the literature reviewed in chapter two. The wider conclusions, recommendations and suggestions for future research are contained in the final chapter.

2. Literature Review

2.1 Introduction

Climate change communications refers to information that is designed specifically to alter people's perceptions of, and behaviour in relation to, climate change, specifically with a view to bringing about a reduction in emissions of climate change gases. How to alter perceptions and behaviour is a complex area of study; there are many ways in which people gain and process information and there are a wide range of factors that influence behaviour (Gardner & Stern, 1996). The research presented here considers how climate change communications can be used to change people's perceptions. In this thesis 'perceptions' are considered to be, in a broad sense, the psychological variables that influence climate-related behaviour. The research is interdisciplinary and draws on several distinct but related areas of literature, which were identified through a literature mapping stage: environmental education; public understanding of the science behind climate change; climate change communications and attitude-behaviour theory. The need to review such a broad range of literature is not surprising given the fact that climate change is itself an inherently interdisciplinary problem.

This literature review is split into two sections, each aligning with the two broad objectives of the research noted in section 1.4. Firstly, in order to set the context for a study of individuals' perceptions of climate change, attitude-behaviour theory is introduced and the psychological variables that influence behaviour are considered. Additionally, existing studies considering what people think and know about climate change are reviewed. Secondly, literature is reviewed in relation to environmental and climate change communications specifically, to identify what other academics suggest works practically to change people's perceptions.

2.2 Defining and modelling perceptions of climate change

2.2.1 Attitudes & Behaviour

Attitudes are abstract, they cannot be seen, heard or touched and they can only be measured by an individual describing what they believe. This has led to some authors questioning the utility of the attitude construct in social psychology (e.g. Potter, 1998). However, even though attitudes remain abstract constructs, they do supply a window on an individual's cognitive structures and are therefore a useful device for assessing how thoughts and feelings contribute to actions (Wall, 2006). Behaviour, on the other hand, can be measured by directly observing the actions of an individual and as such attitudes can be defined as personal orientations towards specific actions or behaviours. Traditionally in relation to environmentally significant behaviour it was thought that knowledge about the consequences of behaviour would lead to the creation of a pro-environmental attitude which would, in turn, lead to pro-environmental behaviour (Kollmuss & Agyeman, 2002).

Hence many behavioural interventions simply supplied information and expected more positive environmental behaviour to be the result, a model known as the 'information deficit' approach (Bulkeley, 2000). Analysis of practical projects that utilised this methodology showed that such a model was not always evident and suggested that there was a gap between attitudes and behaviour, and much academic work has been carried out to try and model this 'value-action gap' (Kollmuss & Agyeman, 2002). There is still no broad consensus on the reasons why this model works inconsistently (Ibid.), but theoretical models of behaviour can help us to visualise the different factors that contribute to behaviour. The general picture from these theoretical models is that there are other important factors, not only attitudes that contribute to our actions. In this part of the literature review, individual level theories of attitudes and behaviour prevalent in the environmental psychology literature are described followed by a consideration of how attitudes are formed in the first place.

2.2.2 Theories of behaviour

Models aim to predict the behaviour of individuals at a distinct event. Even though each behavioural event has different parameters, there are common elements that can be categorised. As such, the purpose of behavioural models is to see why different types of behaviour take place in different types of situations (Triandis, 1977). "Models are never final products" (Ibid.); they are refined and redefined as more research results are synthesised and reported, increasing the models' predictive power and applicability. Consequently, the question of what shapes pro-environmental behaviour is such a complex one that it cannot be visualised in one single framework or diagram (Kollmuss & Agyeman, 2002). The models reviewed below are not considered to be definitive explanations of the factors that contribute to behaviour. Rather, they should be seen side-by-side, each providing a contribution to an overall picture of how behaviour operates.

2.2.2.1 The Theory of Planned Behaviour

Figure 2.1 show Ajzen's (1991) Theory of Planned Behaviour (TPB), which suggests that behaviour is preceded by intention, which itself is determined by:

- Attitudes towards behaviour, which are based on behavioural beliefs. This considers what the individual believes the outcome of the behaviour to be (e.g. cycling to work instead of driving will make them healthier). Attitudes are evaluative in nature and consider whether outcomes will be good or bad.
- Subjective norms based on normative beliefs about whether other people important to them will approve or disapprove (e.g. an individual's partner may be against cyclists on the road). Subjective norms capture some of the influence our peers have on our behaviour and link

the TPB with interpersonal and community theories of behaviour change (Halpern et al, 2004).

- Perceived behavioural control, based on control beliefs about the ease or difficulty of performing the behaviour (e.g. a distance of 2 miles to cycle to work will be perceived as very easy for some, but difficult for others and could depend on cycle lanes, or even owning a bike in the first place).

Depending on the behaviour and individual in question and also the time at which the behaviour is performed, the relative contribution of the three determinants can vary. However, as each determinant becomes more favourable, the intention to behave in a certain way becomes stronger. Furthermore, behaviour itself is directly influenced by Behavioural Control, and consequently, intention does not always lead to behaviour.

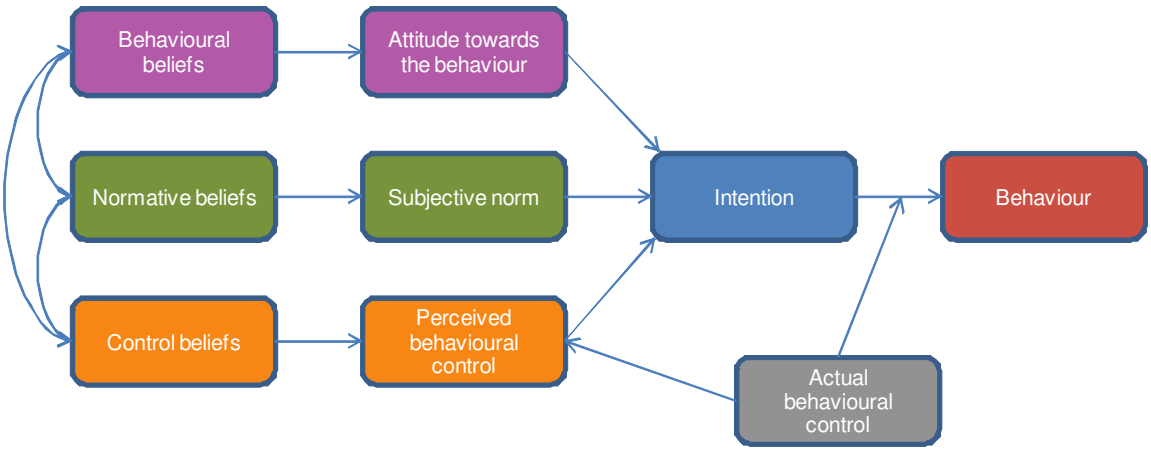


Figure 2.1: The Theory of Planned Behaviour (drawn from Ajzen, 1991)

2.2.2.2 Value-Belief-Norm Theory

Value-Belief-Norm (VBN) Theory (Stern et al, 1999) looks at environmentally significant behaviours specifically, whereas the Theory of Planned Behaviour is applicable to all types of social behaviour. It is based on Schwartz's (Schwartz, 1977) moral norm-activation theory (NAT), and both theories consider behaviour that is altruistic and has no obvious benefit for the individual, as is the case, it could be argued, with many environmentally significant behaviours, such as recycling. Altruistic behaviour is activated when an individual feels morally obliged to prevent harm to important others (Ibid.). In the case of ESB it may be care for the environment itself, or for future generations, that

activates pro-environmental behaviour. A model depicting VBN theory is shown in figure 2.2 as a series of psychological constructs that interact, from general values and attitudes or worldview at the bottom, through awareness of the consequences of behaviour to specific beliefs about how one should act. If these processes interact in a certain manner and activate a personal norm (or sense of obligation to act) the result will be pro-environmental behaviour. Each level affects the next and all subsequent levels and all components of the model need to be in place for behaviour to follow. It is also important to note that values and worldview are relatively stable and are likely to apply from one situation to the next. The more behaviour-specific constructs, such as personal norms and behaviour itself, are more likely to vary in different situations and behavioural contexts.

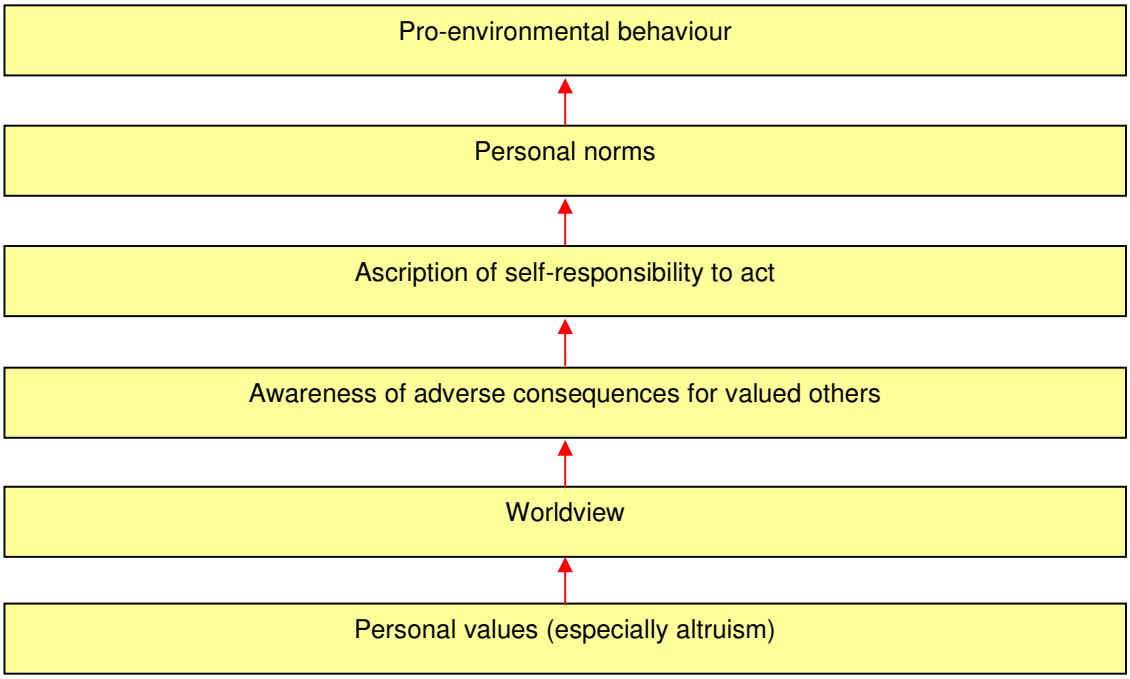


Figure 2.2: Value-Belief-Norm Theory (drawn from Stern et al, 1999)

2.2.2.3 Theory of Interpersonal Behaviour

As we have seen, the TPB and VBN theory are both goal-oriented with the individual processing the information they have and making a conscious decision to behave pro-environmentally or otherwise. The Theory of Interpersonal Behaviour (TIB) (Triandis, 1977) is similar to TPB in that intention is the immediate precursor to behaviour, but it deals with situations where behaviour has become part of routine, which is done by including habit in the model. This is important as much behaviour that has a significant environmental impact is habitual, such as driving or leaving

electrical equipment on standby. Triandis (1977) states that most social behaviour, until it becomes routine, is under the control of intentions. As shown in figure 2.3, constructs similar to those in the TPB and VBN are present, such as norms, attitudes (in the form of behavioural beliefs) and perceptions of control. Habit is seen to affect not only actual behaviour, but also the way in which an individual thinks, or does not think, about the behaviour in the first place.

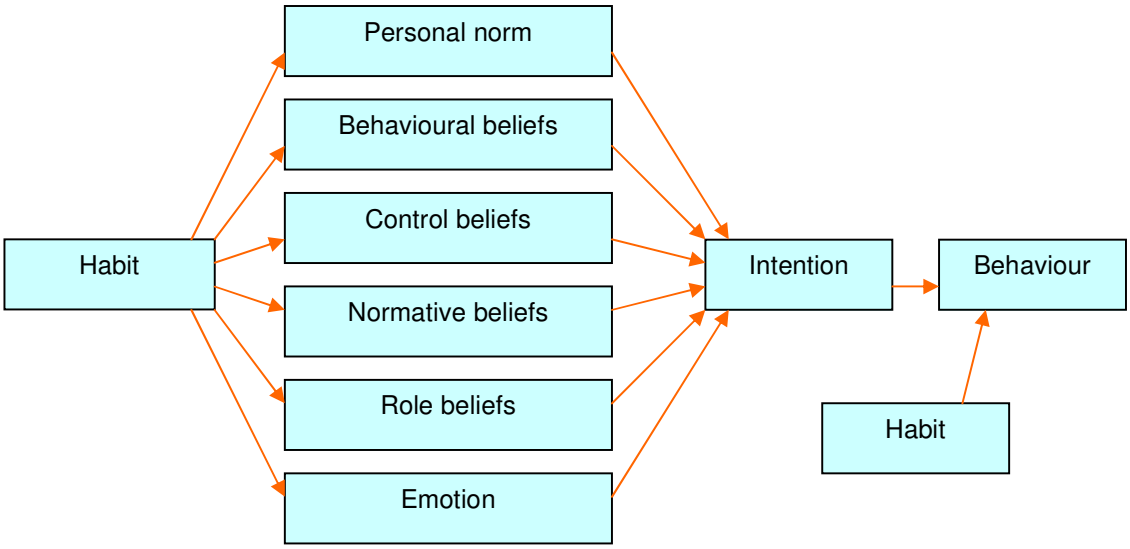


Figure 2.3: The Theory of Interpersonal Behaviour (drawn from Triandis, 1977)

2.2.2.4 Affect versus cognition

Pooley & O'Connor (2000) carried out empirical research that looked at the impact of affect (emotions or what people feel about an attitude object) and cognition (beliefs or what people think about an attitude object) on attitudes towards three specific, local environmental issues: logging, urban development and vehicle emissions. They utilised a survey instrument that accessed environmental attitudes and asked respondents to write down and rate positively or negatively their own beliefs and emotions about the three issues. Using correlation and regression analysis, Pooley and O'Connor (2000) showed that both beliefs and emotions were significant predictors of attitudes and research subjects, when asked directly, stated that affect was the more important of the two. At the time of their research most environmental education programmes concentrated on influencing knowledge (as described in the 'information deficit' model, above) and ignored the affective domain. The results of Pooley & O'Connor's (Ibid.) research suggest that practical environmental education or communication programmes should specifically target both emotions and beliefs when attempting to influence environmental perceptions (Ibid.).

2.2.2.5 Stern's framework of environmentally significant behaviour

Stern (2000a) attempted to filter all the information contained in a number of attitude-behaviour models to produce a single framework that shows the broad number of influences on ESB. He noted that there are four types of causal variable:

- Attitudinal factors, which include norms, beliefs and values in relation to the environment, but also nonenvironmental attitudes that are related to environmental impacts.
- Contextual forces, which include interpersonal influences, community expectations, advertising, government regulations, monetary incentives and costs, ease or difficulty of specific actions, policies to support certain behaviours and the wider social, economic and political context in which behaviour operates. Stern (Ibid.) notes that contextual factors may mean different things to different individuals.
- Personal capabilities, which include the skills or knowledge required to perform specific behaviours, and the availability of time, money and resources needed to perform behaviour.
- Habit or routine, which is important as establishing new patterns of behaviour often involves overcoming old habits.

Research evidence from studies by Gardner & Stern (1996) and Stern (2000b) suggests that particular behaviours are affected to a greater or lesser extent by different causal variables.

2.2.2.6 Operationalisation of 'perceptions'

As noted above, in Ajzen's (1991) Theory of Planned Behaviour attitudes have quite a specific definition, in that they are an individual's beliefs about the positive or negative outcomes of a specific behaviour. Conversely, in his attempt to provide coherence to the academic domain of environmentally significant behaviour, Stern (2000) more loosely defined a series of 'attitudinal factors', which encompass the psychological variables that can impact on how an individual behaves. Kollmuss & Agyeman (2002) define these psychological variables as all the influences on behaviour that reside within an individual's cognitive structures and use the term 'internal factors' (ibid.). This thesis uses the term 'perceptions' to encompass the thoughts and feelings people have about the issue of climate change. The construct has quite a broad definition, in that it includes attitudes towards general concepts (such as global warming) and also attitudes towards specific behaviours (such as driving). Perceptions of climate change also include knowledge of its scientific background and also knowledge of how to behave to mitigate climate change (e.g. by insulating a home and therefore using less energy). Beliefs about the outcome of behaviour (e.g. using less energy will cause less carbon to be emitted to the atmosphere, which will mitigate climate change) are also included, as is efficacy, which is the extent to which people think they can actually have an

effect on climate change. Values are another concept included under the definition of 'perceptions', such as care or responsibility for the environment, future generations or important others. In conclusion, 'perceptions' covers a wide range of constructs and encompasses all the psychological factors that may influence behaviour.

2.2.2.7 Individual Theories of Behaviour - Summary

Human behaviour is ultimately the most important factor in anthropogenic climate change as it is human action that releases greenhouse gases, regardless of how people think or feel about the issue. Stern (2000a, 408) notes that "environmentally significant behaviour can reasonably be defined by its impact: the extent to which it changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself". Environmentally significant behaviour (ESB) can be positive or negative towards the environment; i.e. it can be responsible for the emission of more or less greenhouse gases.

Three models of behaviour have been considered above, which all included, amongst other things, psychological variables. We have also seen that control or contextual factors (for example requisite time and resources) and habit are other important precursors, suggesting why interventions that simply supply information do not always lead to behaviour change: there are a range of pre-cursors or factors that influence behaviour, such as attitudes, personal and social norms and behavioural control (Ajzen, 1991; Schwartz, 1977). Therefore, communications can be used to influence behaviour directly *or* to impact upon its individual pre-cursors. By making each of these factors more favourable, the performance of more positive ESB is more likely (Stern, 2000a) and it is evident that each of these variables can have a greater or lesser impact on behaviour in different circumstances. Of importance to this thesis are the 'perceptions' that contribute to climate change-related behaviour; by influencing individuals' perceptions, we can increase the likelihood of behaviour change to mitigate climate change, which itself is the ultimate goal of academic and policy efforts (Ibid.).

In relation to the case studies considered here, Defra noted that impacting on peoples' perceptions might not have any measurable impact on behaviour (Futerra, 2005a). Defra considered that other mechanisms could, in the future, aim to influence the other pre-cursors of behaviour (Ibid.): for example, communications initiatives such as the UKCCCI may be used to 'prime' the population to accept other government behaviour change initiatives, such as the formulation of more stringent legislation (Ibid.). As such, the case study projects matched the focus of this thesis and were ideal for investigating the insights that this thesis aims to provide: how communications can be used to influence individuals' perceptions of climate change.

2.2.3 Theories of behaviour – discussion

Anthropogenic greenhouse gases are those released into the atmosphere as a result of human behaviour. The release of these gases is due to humankind's desire for energy and the services it underpins, and they are responsible for the enhancement of the greenhouse effect (IPCC, 2007). Consequently, we must consider the factors that underpin the behaviours which cause greenhouse gases to be emitted. Having looked at several theories that model environmental attitudes and behaviour, we can see that behaviour is very complex, has a wide range of contributory factors and is difficult to influence. The theoretical models and case studies that have been reviewed provide valuable evidence for the practical usefulness of modelling these contributory factors. Psychological factors are a very important pre-cursor of behaviour but are not, as suggested by the information-deficit model (Bulkeley, 2000; Kollmuss & Agyeman, 2002), the only contributing factor. Different pieces of empirical research support the utility of all the models of individual behaviour reviewed and some research suggests that combining constructs from more than one theory could provide a more robust theoretical explanation (Ibid.). This was investigated using commuter travel behaviour as a case study by Wall (2006), who used statistical analysis to determine which combination of factors gave the most appropriate account of travel behaviour. It was concluded that explanation of travel-mode choice was improved by a model that used constructs from both the Theory of Planned Behaviour and Norm-Activation Theory and improved again by adding contextual variables to the model (Ibid.).

Other studies have also attempted to bring together the various theories of ESB and to provide a single orienting framework. Kollmuss & Agyeman (2002) base their model on the value-action gap, highlighting the influences on behaviour and emphasising the barriers to action. The authors broke down the antecedents of behaviour into two groups: "internal factors", which reside within an individual's cognitive structure and include knowledge, values, beliefs, worldview and attitudes, and are the equivalent to the construct 'perceptions' as operationalised in this thesis; and "external factors" including infrastructure, socio-cultural factors and cost, which equate to the contextual variables described in Stern's (2000a) framework. According to Kollmuss & Agyeman (2002), the barriers to action in relation to the internal factors include, but are not limited to: a lack of knowledge (e.g. not being aware that insulating an attic means less energy is required to heat a house); existing knowledge that may contradict environmental values (e.g. driving a vehicle with a large engine for comfort and speed, but being aware it uses more energy than a car with a smaller engine); a lack of internal incentives (e.g. positive feedback on performing energy-saving behaviour); and existing values that prevent learning (e.g. valuing consumerism over environmental protection). The main barrier in relation to the external factors is a lack of external possibilities (e.g.

availability of recycling facilities) and incentives (e.g. grants for improving the energy efficiency of a house or installing renewable energy). In Kollmuss & Agyeman's (2002) model, all behaviour is modified by old behaviour patterns or habits.

Approaches to behaviour change can be designed to work on each of these underpinning constructs to prime the individual for behaviour change. For example, the information deficit approach attempts to increase the individual's knowledge and awareness. The other factors that can be impacted upon to influence environmentally significant behaviour are those which address the context in which human behaviour operates, five examples of which are highlighted below (based on Gardner & Stern, 1996).

- The economic situation can be altered to direct the behaviour of the population, which would involve valuing environmental 'goods' and 'services' or by taxing activities that damage the environment. A relevant example here would be a carbon tax for aeroplane flights or for heavily polluting vehicles.
- A regulatory approach could be used to provide legislative control of the environment and apply sanctions to those who break the rules.
- Human ingenuity could be relied upon to engineer scientific or technological solutions to environmental problems, thus affecting the context in which behaviour operates.
- New institutions could be created to help reach sustainability. A good example of this is that there is no body that regulates international aviation and without such an organisation in place, it will be difficult to reduce carbon emissions from this sector.
- Finally, the situation in which behaviour occurs could be addressed; this relates to issues such as infrastructural support for sustainable actions, for example the provision of cycle or bus lanes.

The 'ecological approach' described by Halpern et al (2004) in a paper for the Cabinet Office suggests that pro-environmental behaviour change will be more likely if each of the psychological and contextual factors described above are made more favourable. The authors (Ibid.) also point out that there are four different societal levels at which the behaviour change approaches sit and highlight examples of appropriate interventions at each level. The approaches to climate change mitigation adopted in the three case studies are personal level interventions.

	Societal level	**Possible interventions**
1	Personal	Attitudinal information, changing values

2	Interpersonal	Information provision
3	Community	Provide local infrastructure
4	Socio-cultural	Creation of new institutions, regulatory approaches

.

Table 2.1: Appropriate interventions at different societal levels (drawn from Halpern et al, 2004)

We can draw a number of conclusions from this review of attitude-behaviour literature, the most important being that there are a massive range of influences on our actions. Consequently, there are a wide range of methods that can be used to attempt to bring about behaviour change. Looking at the Theory of Planned Behaviour and Value-Belief-Norm theory, we can see that psychological factors feed into behaviour, including environmentally significant behaviour. It is evident from the theoretical insights reviewed here that if all other factors such as the context are held constant, the more favourable the psychological variables, the more likely it is that behaviour will take place. As such, communications interventions targeting individuals' perceptions can feed directly into behaviour change or could be used to prime the public for enforced change through regulation or legislation. It is to research on current perceptions that this chapter now turns, looking at previously published literature on knowledge, understanding and attitudes towards climate change, followed by a review of literature that monitors and makes recommendations regarding practical climate change communications.

2.3 Perceptions of climate change

2.3.1 Introduction

Section 2.3 looks at what perceptions people have currently in relation to climate change. There have been several pieces of research, both academic and non-academic, completed concerning adults' knowledge, attitudes and beliefs about energy use, climate change, global warming and the greenhouse effect (e.g. Defra, 2002; MacGowan & Sauter, 2005; Norton & Leaman, 2004; Poortinga et al, 2006). This research has largely been quantitative in nature and has asked questions about a broad range of perceptions. Furthermore, research has been completed in this area that looks specifically at young people of school age (Andersson and Wallin, 2000; Boyes & Stanisstreet 1993). A broad-ranging overview of quantitative studies of UK perceptions of climate change was carried out by DfT (2006). The general picture from this body of research is that public awareness is very high and knowledge has been increasing over the last several years, parallel to the expansion of climate change information but the public appear to lack a detailed scientific understanding.

2.3.2 Studies of climate change perceptions

In addition to awareness of general climate change related terms, which as noted above is "near universal" (Whitmarsh, 2009a, 414), many previous quantitative surveys have tapped into other aspects of awareness, including causes, impacts and mitigation strategies. Respondents in several research studies have generally been able to recognise the correct causes of climate change from a list of possibilities (e.g. Bostrom et al, 1994; Hinds et al, 2002), and this awareness increased considerably since climate change became a subject on the public's radar (Defra, 2002; Lorenzoni & Hulme, 2009).

Further to the general picture described above, Whitmarsh (2009a) points out that the bulk of previous research into climate change perceptions has been quantitative in nature and criticises this approach by suggesting that conclusions from these quantitative studies are called into question. This is because deep, genuine understanding of climate change is not tapped into via survey instruments; rather they simply discover whether participants have "superficial recognition of abstract terms used in survey checklists" and do not allow "participants to express their understanding in their own words" (Ibid., 417). Consequently, there are few recent, wholly qualitative studies of climate change perceptions, thus a mixed-method study involving quantitative and qualitative analysis, as presented in this thesis, takes a new approach to research in this area whilst also allowing comparison to previous studies.

Another important feature of people's perceptions of climate change is whether they think it has anthropogenic causes. Individuals in the UK acknowledge that humans contribute to climate change (Lorenzoni & Hulme, 2009), with 87 percent of people in a 2006 survey either stating that the problem is caused mainly by humans or a combination of human activity and natural variability (Downing & Ballantyne, 2007). Furthermore, based on her own research results and those from previous studies reviewed for her paper, Whitmarsh (2009a, 416) concludes that "responsibility for tackling climate change is most commonly placed with international organisations", the public "disassociate themselves from the causes, impacts and responsibility from tackling climate change" and there is "widespread scepticism about the reality of or human causes of climate change". Research indicates that climate change is seen as a distant threat either in space (e.g. it will effect people in different parts of the world) or time (it will effect future generations) and both risks and benefits are perceived as being greater for society than individuals (Lorenzoni & Hulme, 2009). Consequently, as will be explored in more detail below, the public are aware of climate change as an issue but appear to have a superficial knowledge of the subject. This has led to only a minority of the public in the UK actually taking action to mitigate the problem (Norton & Leaman, 2004). The

implication of these research results is that communications still have a significant role to play to change perceptions and, ultimately, behaviour (Lorenzoni et al, 2007).

Lorenzoni et al (2007) looked at the results of three separate studies of climate change perceptions to identify common barriers that people perceive to prevent them engaging with climate change at a cognitive, affective or behavioural level. They identify perceived barriers at two levels; the individual and societal. Barriers at the individual level include:

- Lack of knowledge about the causes, consequences and potential solutions to climate change
- Uncertainty and scepticism about the causes of climate change, its seriousness and the effectiveness of mitigative actions
- Distrust in information sources such as the media
- Externalising responsibility and blame (e.g. to the government or industry)
- Seeing climate change as a distant threat in time and space
- Seeing other issues as more important
- A reluctance to change lifestyle (i.e. consumerism)
- A fatalistic attitude
- Helplessness as an individual mitigating a global scale problem

Barriers at the societal level include:

- Lack of political action at various levels of governance
- Lack of action by business and industry
- Worrying that others are not playing their part in climate change mitigation
- Social norms (e.g. to consume more)
- Lack of enabling facilities (i.e. public transport)

2.3.3 Knowledge about climate change

Relating specifically to scientific understanding of climate change, there has been little research carried out in the UK but some studies have been carried out in similar political and economic contexts, such as Europe, Australasia and North America (e.g. Bulkeley, 2000; Moser and Dilling, 2007). The prevalence of research in this area is a good yardstick against which to measure current thinking about the need for scientific understanding of climate change amongst the public. When climate change was first gaining credence as a salient scientific and policy issue in the early 1990's, public scientific understanding was considered a necessary adjunct to mitigation behaviour and there was a large amount of research exploring this knowledge (Kempton, 1993; Pawlik, 1991).

The dearth of more recent research in this area mirrors the apparent current opinion that detailed scientific knowledge is not necessarily needed for successful mitigation strategies (e.g. Bulkeley, 2000). However, the increase in media and public interest in climate change through the latter years of the first decade of the 21st century (Ereaut & Signaut, 2007), suggests this is something that does again require research.

Recent research was conducted by Whitmarsh (2009a) to identify and compare individuals' understanding of "climate change" and "global warming", and to identify any implications for communications. She discovered important differences between research subjects' understanding of, and response to the two different terms. People tended to know more about "global warming" and it was more likely to be considered to be both human induced and more concerning than "climate change". Additionally, respondents were more likely to think that individual or collective action could mitigate "global warming". This research into perceptions obviously suggests that framing communications around the term "global warming" is more likely to produce the desired attitudinal and behavioural responses. However, Whitmarsh (Ibid.) cautions that "global warming" is more likely to be associated with ozone depletion and as such, may contribute to misconceptions about the issues (see section 2.3.5, below). The two terms are understood in different ways by the public and, consequently, they should not be used interchangeably by communicators as they may evoke different responses in different groups of people. Rather, the most appropriate term in which to frame communications depends on the people that one is attempting to influence.

2.3.4 Common misconceptions about climate change

In order to identify common misconceptions about climate change, literature was reviewed to discover what people misunderstood about the issue. Gowda et al (1997) completed a survey of American high school students with the specific aim of discovering the nature and origin of students' misconceptions and providing recommendations about how educational interventions can remedy this problem. Although this research was conducted in a different country to the present research, other studies in a UK context also point to similar conclusions (e.g. Boyes & Stannistreet, 1993). Gowda et al's (1997) survey instrument used both open-ended questions to explore this issue in-depth and closed scale-type questions to compare to previous studies. The following 'frequent' mistakes were identified and possible explanations for these mistakes were offered.

1. Overestimation of temperature change. This may be due to the fact that one of the most common sources of climate change information is the media who tend to dramatise scientific issues to increase a story's interest. This exaggeration is still evident in the UK media today (Ereaut & Signaut, 2006) and can feed into public misunderstanding.

2. Attribution of climate change causes to other, unrelated environmental harms. 'Fuzzy environmentalism' (Bulkeley, 2000), where individuals group a range of environmental issues into a single framework.
3. Confusion between ozone depletion and climate change. This particular misconception is highlighted throughout the literature (i.e. Bulkeley, 2000; Boyes & Stanisstreet, 1998; Kempton, 1993; Gowda et al, 1997) and is by far the most common example of fuzzy environmentalism in relation to climate change.
4. Confusion between weather and climate leading to individuals stating that they have personally noticed the climate changing. In a study at the start of the 1990s, Kempton (1991) points out that it is extremely unlikely that people living in variable, mid-latitude climates, such as the UK, could actually recognise changes in long-term climate patterns and it is more likely that short-term changes in weather are being noticed and attributed to climate change. However, heightened public awareness due to the recent increase in media and political interest in climate change, coupled with extreme weather events does suggest that it is now more likely that individuals could perceive actual changes in climate patterns.
5. A fifth misconception is offered by Koulaidis & Christidou (1999). The greenhouse effect is seen exclusively as a man-made environmental problem and not a natural phenomenon enhanced by industrialisation. It is suggested that inadequate teaching methods could explain this.

Back in the early 1990's when climate change was first becoming a salient issue, it was identified by Kempton (1993) and Pawlik (1991) that there was a need to communicate climate change more effectively to the public. This is because human perception of, and reaction to, global change is not a matter of sensory psychophysics but of social communication (Pawlik, 1991). Kempton (1993) looked at a number of public surveys of concern about climate change (which he described as "Mid-high") along with several other factors that could contribute to behaviour including knowledge about appropriate responses, inconvenience, cost and control by consumer. This process was also carried out for two other environmental problems, ozone depletion and municipal solid waste, to see which factors needed to be favourable in order to elicit environmentally positive consumer and political responses. Taking the example of ozone depletion caused by chlorofluorocarbons (CFC's), which can be emitted from various sources that involve consumer choice over purchase (investigated in this study were spray cans and car air-conditioners), Kempton (1993) points out that despite the high level of public concern, the consumer and political actions were markedly different in relation to the two sources highlighted above. Whilst consumers immediately reduced their usage of CFC spray cans and government put legislation in process to ensure a reduction, there

was very little done to combat emissions from car air-conditioners on both an individual and political level (Ibid.). Kempton contends that this is because response knowledge was high for the consequences of using spray cans but low for automobile A/C units. Furthermore, the inconvenience of changing spray cans is insignificant if there are other products available, whereas driving around in an overheated vehicle is quite uncomfortable. Finally, the control that consumers have over using spray cans is much greater than that which they possess when deciding whether or not to have A/C in their car (which may already be installed when purchasing a second hand vehicle or a new car off a garage forecourt).

Kempton (1993) relates the contributory factors of climate-change-related behaviour (described above) to two methods of reducing global warming; using energy efficient equipment and energy conservation. He concludes that energy efficient equipment had not been adopted due to low knowledge of appropriate responses, high economic cost and variable consumer control despite there being mid-high level public concern and low inconvenience. Similarly, in the case of energy conservation, there was mid-high level public concern and zero cost but low knowledge of appropriate responses and mid-level personal control meant there was little action (Ibid.). The article concludes by stating that "global warming…exhibits virtually all the barriers to effective action" from political and individual perspectives and that "factors other than concern…are blocking action or directing it towards ineffective responses" (Ibid., 238). This work was carried out in a US context because, as the author points out, the data available from other countries at that point in time was incomplete. However, similar conclusions can be drawn from the present situation in the UK where, as can be seen in the results of several surveys (e.g. COI, 2006; DfT, 2006), awareness remains high but action is insufficient. The problem (of inappropriate communication) first identified and researched by Kempton (1993) nearly 20 years ago remains pertinent and utilising some of his conclusions could still be worthwhile for policy makers and communications practitioners in the UK today.

More recently, Whitmarsh (2009b) found that the most frequently cited behaviour that people perform to mitigate climate change was recycling. Generally, although recycling can reduce energy usage due to decreased energy needs for production of goods, its main environmental benefit is resource conservation and there are many more effective energy conservation behaviours; energy saving should be considered more of a secondary benefit of recycling rather than its primary function. Whitmarsh (Ibid.) cites Stern's (2000) definition of 'impact-oriented' and 'intent-oriented' environmental behaviours (where intent-orientated behaviours are carried out with the express purpose of benefitting the environment) and points out that the public recycle to mitigate climate change when it actually has limited impact to mitigate the problem. Whitmarsh (Ibid.) also

concludes that actions that do mitigate climate change are often not carried out specifically for environmental reasons, rather other factors are more important. For example, reducing car use is done for convenience, health and money-saving reasons.

2.3.5 Sources of climate change information

This section considers which sources people obtain their information about climate change. If communications are to change individuals' perceptions of climate change, they must understand the channels through which people receive information. From such a perspective, intervention methodologies can be designed that are based on data collected from real-life situations (Kempton, 1993).

In the UK, the proliferation of climate change information into the public domain can be seen by the growing extent of stories in newspapers (both quality papers and the tabloid press), the number of articles and programmes on television and radio and the wealth of information available on the internet. The media has a vast influence on people's attitudes towards climate change, affecting individual's conceptions by reporting events and facts from a certain perspective and even choosing what to report in the first place (Fortner et al, 1998). The United Nations Conference on Environment and Development (UNCED) took place in 1992, which included the UN Framework Convention on Climate Change (UNFCCC), and despite the significance of this event in global politics it led to little further information being placed into the public domain regarding climate change mitigation (Ibid.). Without information upon which to act, it is unlikely that the desired pro-environmental behaviour can be created amongst the global population. Even leading up to the signing of the Kyoto Protocol in 1997, which solidified a global plan of action to mitigate climate change, media coverage of the issue was relatively scarce (Ibid.; Nitz et al, 1996). Since then, the extent of climate change material communicated to the public through the media has escalated considerably, but the perspective from which it is reported remains an issue of concern for environmentalists (Fortner et al, 1998).

Antilla (2005) reviewed newspaper coverage of climate change in the United States over a one-year period. She discovered that, despite the scientific consensus about anthropogenic climate change in peer-reviewed journals, it is still often represented in the media as a contentious issue about which agreement in the scientific community is by no means certain. The US media hold the ethical position of objective reporting and therefore "provide balance while reporting on climate change" including "rebuttals by experts who, often through think-tanks, are affiliated with the fossil fuel industry" (Ibid.). As such, the strong scientific support for anthropogenic climate change is misrepresented and public knowledge of the issue becomes skewed. This has led to calls for

removal of the right to hear both sides of the argument in media stories in cases where the scientific evidence appears incontrovertible (i.e. Gelbspan, 2004), as appears to be the case in relation to climate science.

In a UK context, Carvalho (2005) looked at the representations of climate change in the media by three 'quality' newspapers, all of which are associated with a particular political ideology. She looked at the number of articles in the press and discursively analysed their content over a period of sixteen years (from 1985-2000). The results were then compared to government policy and discourses in relation to climate change and it showed that the common themes prevalent in each newspaper aligned with their political viewpoints and sided with or against the government, depending on which party was in power. Despite the left-wing press' protestations against some governmental policy initiatives during the study period, the main conclusion was that there appeared to be no sustained and coherent questioning of the dominant theoretical position that economic growth and consumerism can be balanced effectively with greenhouse gas mitigation and global environmental justice (Ibid.)

The Institute for Public Policy Research (Ereaut & Segnit, 2006, 2007) carried out research into how climate change is currently communicated to the public in the UK and made some interesting conclusions regarding dominant discourses and themes. The positions on climate change evidenced in media coverage and in communications designed to change attitudes and behaviour were examined. The first report, published in 2006, highlighted three broad positions: 'alarmism'; 'it'll be alright'; and 'it'll be alright if we do something'. It concluded that "the climate change discourse in the UK today looks confusing, contradictory and chaotic… It seems likely that the overarching message for the lay public is that in fact, nobody really knows" (Ereaut & Segnit, 2006, 7). In particular, the authors noted a tension between messages stressing the catastrophic nature of climate change ('alarmism') and those stressing the importance of small, individual actions ('it'll be alright if we do something'). A year later, the second report (Ereaut & Segnit, 2007) argued that much has changed. There is now little room for scepticism in the mainstream and alarmist hyperbole has been toned down so that there is less tension between descriptions of the climate change problem and prescriptions for individual actions that can help to solve it. However, it is notable that this latest IPPR report, despite examining some "local material" from non-governmental and "local campaign organisations" (Ibid.), does not consider either the UK Climate Change Communications Initiative as a whole or any of the individual projects it funded. Given the Fund's scope and the fact that the combined target audience of its communications ran to many millions, it is important to add some evaluation of projects' success to the conclusions drawn by the IPPR analyses.

2.3.6 Baseline surveys

Of particular importance to this thesis is the research carried out by the Central Office of Information (COI) (commissioned by Defra), which surveys a nationally representative sample of the UK every six months to evaluate overall changes in citizen's perceptions throughout the UKCCCI. In addition to the COI research, which surveyed the adult population of the UK, data were also collected in relation to the perceptions of young people. Defra commissioned LVQ (2006) - a specialist youth research agency - to randomly sample 749 youngsters in the UK; the age range was 11-17 years. These two particular datasets are used as a baseline against which all individual projects funded under the UKCCCI can be judged. From a practitioner point of view, this dataset could be used as a starting point or baseline from which communications strategies can be devised. As the data collected by COI and LVQ are being used as a comparison for the case studies in this thesis, detailed results from their surveys are not given until the relevant sections in the empirical chapters. However, in order to give a general picture, the questions asked by the agency are divided into 4 themes: -

1. Awareness, where questions consider: belief in climate change; human contribution to climate change; factors contributing to climate change and individual responsibility; consequences of climate change; the timeframe associated with impacts; and feelings about the consequences of climate change.
2. Impact, where questions consider: environmental, social and economic impacts of climate change; and individuals' impacts based on lifestyle.
3. Influence, where questions consider: who can influence, and who already is, influencing the climate change agenda; and personal ability to use less energy.
4. Information, where questions consider: who talks about climate change (e.g. famous people); where individuals gain information about climate change, and if subjects have personally noticed changes in climate.

The data described above were collected by means of a telephone questionnaire survey, administered by agents of research companies. As pointed out by the Department for Transport (DfT, 2006), most data that has been collected in the past regarding climate change perceptions, across all age ranges, has utilised a questionnaire survey methodology. This is potentially useful for tracking changes over time, but there are some negative features associated with such a methodology: the face-to-face nature of questionnaire data collection could lead to socially-desirable responses and subsequent bias in the results; and closed questions (where respondents have to tick pre-defined answers) could reduce the 'richness' of the data (Ibid.). Asking questions

specifically about climate change could exaggerate its importance to individuals who have to deal with a whole range of other, often more pertinent, issues and concerns as part of their daily lives.

2.4 Climate change communications interventions

2.4.1 Introduction

This section of the literature review presents studies that assess projects which aim to influence individuals' perceptions of climate change. Although there are relatively few studies in the academic literature, this area of research is a burgeoning area given the increasing number of practical initiatives that are taking place. Studies into how to alter general environmental perceptions are more prevalent and several such studies are drawn upon in this review of literature.

As noted in section 2.3 and by Dilling & Moser (2007), in the introduction to their book *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*, there is a scientific consensus about the reality of climate change but, as yet, this has not been matched by sufficient action at any societal level. As the authors point out, there is "a lack of real progress as yet on effective solutions" (Ibid., 3) and they suggest that better communication is necessary to ensure sufficient action. Dilling & Moser (Ibid.) also point out that awareness of climate change is high (in terms of the issue itself, including the causes and consequences), but concern is much lower. This disconnect is similar to the 'value-action gap' (Kollmuss & Agyeman, 2002) between positive environmental attitudes and pro-environmental behaviour highlighted in section 2.2. Dilling & Moser (2007) suggest that communication is a key tool in changing perceptions and reviewed below are studies that identify recommendations for how to design communications to be more effective.

2.4.2 Recommendations for practical intervention methodologies

Abrahamse et al (2005) reviewed a wide range of published studies of communication interventions around reducing energy use in an attempt to identify what techniques work best. The authors made several conclusions relating to practical methods of influencing perceptions and behaviour, and confirm via their meta-analysis that attitude and knowledge are generally positively related to energy saving. However, they also conclude that "information alone is not a very effective strategy" as it only "tends to result in increases in knowledge" about energy conservation, but not behavioural responses (Ibid., 281). Rather, the most effective way to influence behaviour is to use a combination of 'antecedent' and 'consequence' strategies. Such a strategy would involve providing information about energy use followed by rewards for changing behaviour (such as monetary incentives) and feedback on actions taken (for example, telling people how much energy they have saved on a weekly basis). By diagnosing the barriers to behaviour change, the appropriate

combination of methods can be specified (Ibid.). An example of this diagnosis technique identified by the authors is that educational programmes would be useful for reducing energy use if the target audience are found to be unaware that their energy use is contributing to climate change.

On a similar note, Whitmarsh (2009b) advocates trying to get the most out of communications projects by specifically targeting activities with high energy use or sectors of the public that may not currently be engaged with climate change; such an approach will produce 'big wins'. Specifically, this might involve designing a communications initiative to highlight the behaviours that save the most energy. Alternatively, aiming communications at, or attempting to directly engage those people who do not receive much information on climate change (the example highlighted here is readers of tabloid newspapers as opposed to quality newspapers) would be a useful methodology for mitigation initiatives (Ibid.). Another key finding of Whitmarsh's (2009b) study is that designing communications to impact on moral norms is worthwhile, as moral obligation is a powerful contributory factor to ESB.

Several more recent studies of climate change perceptions, some of which have been described in earlier sections of the literature review, made practical recommendations about communications methods. Lorenzoni et al (2007), following their identification of barriers to engagement with climate change, caution that 'the public' is composed of individuals and is "heterogeneous" with a "diversity of conceptualisations of climate change" (Ibid., 454). Each individual has existing beliefs and knowledge but there are cultural discourses that reflect societal perceptions. Therefore the barriers to engagement differ between individuals and different types of communications are likely to be required with different people. This is cognisant with socio-constructivist learning theories, and such an approach is advocated by authors such as Colman (2006) and Pruneau et al (2003). Additionally, a targeted approach to different people is recommended by Whitmarsh (2009a). Data for Lorenzoni et al's (2007) research was collected in approximately 2003 and it would be interesting to see if their conclusions are still evident, following further increases in the salience of climate change as an issue amongst the UK public.

Spence & Pidgeon (2010) studied how the way in which climate change communications are framed impacts on their effectiveness. They used the IPCC (2007) data on potential climate change impacts to produce different communications tools, which emphasised either local ('climate change will impact Britain's coastlines') or distant ('climate change will impact Europe's coastlines') impacts, and either gain frames ('by reducing energy use we can prevent flooding') or loss frames ('if we do not reduce energy use, flooding is likely to occur'). Results indicate that discussions of the gains to be made from behaving to mitigate climate change are more likely to have a positive

influence on perceptions. Similarly, focusing communications on distant impacts of climate change is more likely to engender a belief that its impacts will be more severe. Spence & Pidgeon (Ibid.) also point out that imagery, such as photomontages of potential impacts or photographs of real issues that could be further exacerbated by climate change, are useful tools for communicators aiming to alter perceptions.

Lorenzoni & Hulme (2009) conducted research in the UK and Italy to compare people's perceptions of climate change via the use of future scenarios of socio-economic and climate change. Via factor analysis, they identified four typologies of publics amongst their sampled population across the two countries, which were based on their perceptions about the importance of climate change and whether or not they thought human activity affected the climate. The four typologies were as follows:

- *Denying*; climate change is not a threat to humans, it is unimportant and not caused by human activity.
- *Doubting*; climate change is not caused by humans but it is important and should be acted upon.
- *Uninterested*; climate change is due to human activity but it is not important or worth engaging with.
- *Engaging*; climate change is concerning and important, it has been caused by humans and needs to be acted upon.

Lorenzoni & Hulme (Ibid.) also concluded that information as a tool to change perceptions only works when it is trusted, so the organisation or people carrying out the communications and the content of the communications in terms of referencing 'who says what', is important. Furthermore, information appeals only tend to work if they are consistent with recipients' existing beliefs (Ibid.). This relates to Festinger's (1957) theory of cognitive dissonance, which postulates that people try to ensure the continuation of their perceptions of an issue, as otherwise they would experience psychological distress. In relation to climate change, cognitive dissonance may cause individuals not to act to mitigate the problem as they may have a consumerist disposition which does not sit comfortably with prudence in relation to energy use. Communications in the form of information could, in this example, actually lead to resistance to change perceptions and behaviour or the reinforcement of existing (negative) views about climate change. As such the content of communications for specific groups of people and target audiences is highly important.

In addition to the broader issues identified above, Lorenzoni and Hulme's (2009) study also led to a range of recommendations about climate change communications at a practical level. Scientific

scenarios portray potential impacts of climate change in around and above 50 years time. This timescale is reflected in governmental policy, such as the UK target for an 80% emissions reduction by 2050 (DECC, 2009). Study participants found that conceptualising how the world might look this far in the future was difficult and depicting future scenarios in around 20 years time would be more relevant (lorenzoni & Hulme, 2009). Additionally, explaining the basis on which the scientific data has been interpreted would be appreciated (Ibid.), along with more details of how climate change might imp[act at the local level. People will not simply take information from the institute of science at face value and would also like to see how it would affect their own daily lives in addition to far off places. Finally, appealing to people's fears using shock or alarm should be avoided (Ibid.) as it might not engage recipients of communications (which concurs with recommendations following other studies, such as Ereaut & Signaut, 2006).

2.4.3 Interventions aimed at young people

Devine-Wright et al (2004) point out that "research focusing upon children's perceptions of global warming has typically been framed around the quality of their scientific understanding of the problem" and the situation in which climate change issues are set has generally been ignored. Such a methodology is often employed when delivering environmental education projects and the main focus has been to increase scientific understanding (Pooley & O'Connor, 2000) and expect pro-environmental values to automatically be engendered. Devine-Wright et al (2004) recommend that approaches which do not aim solely to increase scientific understanding may be more likely to change perceptions and effects on lifestyles should be emphasised.

An interesting paper by Pruneau et al (2003) looked at a socio-constructivist climate change education project offered in two Canadian schools where the impacts were brought down to a local level. This methodology studied by Pruneau et al (Ibid.) is similar to that advocated by Devine-Wright et al (2004) and the project delivery mechanisms included site visits, practical tasks, co-operative learning and plenary learning to reinforce what had been taught throughout the process. Results suggested that the children learnt a lot about how climate change will affect them personally, along with a number of lifestyle changes they could make that could reduce their own impact on the climate. However, there was no mechanism in place during the learning process to engender the positive attitude that individuals can do something about climate change and the project, although successful in the sense of improving understanding, was flawed because of this. This highlights the importance of creating both knowledge of what can be done to mitigate climate change and a self-efficacious attitude.

Multidisciplinary problems, such as climate change pose a difficult challenge for school education due to the discrete curricula associated with traditional subject-based learning (Gowda et al, 1997; Falk, 2005). There is therefore value in non school-based approaches. The research of Devine-Wright et al (2004) made recommendations for energy and climate change education and for environmental education in general by showing that the membership of a non-school based co-operative learning environment (The Woodcraft Folk, which is the organisation that carried out one of the case studies considered in this thesis) heightened children's knowledge and awareness about climate change and made them more self-efficacious with respect to mitigation (in relation to a control group of the same age). The study did not assess a particular intervention methodology using 'before' and 'after' questionnaires, but simply evaluated the effect of being part of a group that regularly meets and propounds a positive environmental ethic to the young people who are members. The individuals who are members of the WF may be different to the general population in that they are engaged in a lifelong education process (or at least the number of years during which they attend WF events), which one would suspect would be more powerful than a single engagement event targeting the general public. Devine-Wright et al (2004) also surveyed adult members of the Woodcraft Folk and compared their responses to those of the children whom they are responsible for teaching. Results showed that adults were less likely to exhibit positive attitudes towards climate change mitigation, bringing into question the morality of engendering a positive attitude amongst children when those responsible for the education and engagement may feel more apathetic (Ibid.).

Uzzell (2000) carried out a similar longitudinal study to Pruneau et al (2003), looking at the attitudes, opinions and ideals of a group of 15-year old students before and after a week-long environmental education course. He found that immediately after the education programme, concern about environmental issues had increased, but 6 weeks afterwards concern had receded below pre-intervention levels. This may be explained due to the negation of situational and contextual factors in the environmental education process; in this case children were taken to a place unconnected with their daily lives and taught science with little acknowledgement of how this could manifest itself in their day-to-day activities. Such a practice is unlikely to engender a positive environmental ethic and is the subject of further criticism in the literature (Pooley and O'Connor, 2000; Uzzell, 1999). Uzzell's (2000) research backs up Devine-Wright et al's conclusions, suggesting that the context in which individual behaviour operates should be part of climate change communications.

2.4.4 Free-choice learning

There is a burgeoning area of academic literature that relates to free-choice learning and the environment; this was the subject of a full volume of *Environmental Education Research* in July 2005. Free-choice learning is relatively easy to describe, but may be harder to conceptualise given that it represents an opposing view to the common notion of learning as a tool designed by educators to increase the knowledge of their subjects and carried out in formal settings, such as schools (Heimlich, 2005). Free-choice learning adopts the perspective of the learner and considers those situations where they may not be consciously aware that they are being taught something, but by their choice of activity they are actually increasing their knowledge and engaging in a learning process (Ibid.). Examples of free-choice learning environments include a visit to a nature reserve, national park or museum, reading an article about the environment in the newspaper or choosing to watch a nature programme on television.

Ballantyne & Packer (2005) define free-choice learning as that which is driven by the needs and interests of the learner rather than by the dictates and needs of an external authority, such as a school or college. This concept is particularly pertinent for environmental education as most environmental learning is not acquired in school but outside of school through free-choice learning experiences (Falk, 2005). When adults decide to take their children to a zoo, their motive may simply be to spend an enjoyable day with the family, but there is a process of environmental learning going on, with the whole family taking in the animals' behaviour or reading signs on the enclosures regarding their natural habitats. Falk (2005) goes on to describe an "environmental learning infrastructure", which includes all the places where learning occurs such as the formal school and university systems and the free-choice learning sector described above. Given that learning is such a complex and individualistic process, no two people learn the same things in the same way and they take different things from each type of learning and place them alongside the information that is already in their cognitive structures. This procedure is carried out in a social context and humans constantly interact, discuss and talk things over with one another, hence the term socio-cultural learning (Ibid.). The formal section of the infrastructure tends to be used for deeper learning (for example, studying for a degree at an academic institution). On the other hand, lifelong and more general learning tends to be carried out through free-choice mechanisms. The implications of this discussion for the process of environmental education are that the range (or infrastructure) of instruments needs to be in place and the message delivered by educators in free-choice settings must be designed to ensure changes in knowledge and attitudes are positive and not neutral or even negative (Ibid.).

In the context of the present thesis, free-choice learning is considered important in its guise as a tool for changing perceptions of climate change. Ballantyne & Packer (2005) present examples of how informal educational settings can promote environmentally sustainable attitudes and behaviour and point out that the development of pro-environmental perceptions is one of the primary goals of institutions where free-choice environmental learning usually takes place (Ibid.; Woods & Moscardo, 2003). Ballantyne & Packer (2005) suggest that encounters with nature can be a facilitator for attitude change as they evoke an emotional response in those taking part. They also identify two other factors that are most likely to engender more positive environmental perceptions: challenging learner's beliefs; and enhancing their environmental conceptions (Ibid.). An intrinsic problem with free-choice learning from a socio-constructivist perspective is that individuals will be at highly differing points on the learning scale with regard to emotions, beliefs and knowledge. This has implications for strategy design, suggesting that a combination that hits all the factors contributing to behaviour, including attitudes and knowledge, will be most likely to reach more individuals and therefore be more successful. Ballantyne & Packer (Ibid.) also point out that understanding learners' current conceptions will help identify which perceptions need to be addressed and therefore communications can be designed more effectively.

2.4.5 Using existing perceptions to inform communications

Research from a geography perspective, such as that by Barr and Gilg (2006), has confirmed Stern's (2000a) assertion that perceptions such as attitudes and values can, in some situations, contribute to ESB and that the value–action gap is not always present. Their survey of the public in Devon asked people how often they enacted a number of ESBs and respondents' answers were subjected to cluster analysis to identify "lifestyle groups" (Barr and Gilg 2006, 911). Four clusters were identified: committed environmentalists; mainstream environmentalists; occasional environmentalists; and non-environmentalists. A clear link between behavioural commitment and environmental values and attitudes was observed. With regard to values, the authors point out that "biospheric and ecocentric values were held by those who were committed environmentalists, with anthropocentric and technocentric values held by nonenvironmentalists" (Barr and Gilg 2006, 918). Similarly, regarding attitudes, they report that "the environmentalist clearly has a positive, confident and responsible attitude towards environmental protection" (Ibid., 918) and advocate different messages for attitudinal and behavioural interventions with these different lifestyle groups. Similarly, Lorenzoni & Hulme (2009, 396) state that "communication effectiveness and range are likely to be increased when tailored to publics according to their segmentation of beliefs and attitudes".

From a qualitative and quantitative assessment of public understanding of climate change in Newcastle, Australia, Bulkeley (2000) reports that respondents received most information from the media, friends and family but that they received the most trusted information from the institutions of education and science, a contention also expressed by Gowda et al (1997). This suggests an important role for these two information sources in changing climate change perceptions. Lorenzoni & Hulme (2009) also explored trust in science as part of their work comparing perceptions of climate change in the UK and Italy. They discovered that scientific information about the impacts of climate change works as a communication tool for changing perceptions only when the individual trusts where the information comes from. If there is no trust in the credibility of the scientific information provided, then information provision could have the opposite effect to that desired and actually become a reason for inaction (Ibid.).

A problem for school education is the discrete curricula associated with subject-based school learning and the lack of lessons adopting a multidisciplinary outlook (Ibid.). The results from Bulkeley's (2000) focus groups suggested that trust in science and education is not absolute and the process of actually deciding what an individual believes and understands is highly personal and unique to each individual. This provides a practical example of the theory of socio-constructivist learning which suggests that "perceptions, memories, and other complex mental structures are actively assembled or built by the mind, rather than being passively acquired" (Colman, 2006) and that each person receives and interprets information differently depending on their existing knowledge structure. This supports Barr & Gilg's (2006a) conclusion that different groups of people should be targeted by different communication interventions.

2.4.6 Interventions to improve understanding of climate change

Pawlik's (1991) study suggests that the inability to perceive climate change can create or exacerbate public misunderstanding, which can, in turn, reduce the likelihood of behaviour change. Using theory from experimental psychology, Pawlik classifies five characteristics of climate change that are "inadvertent in psychological terms" which, he argues, may be responsible for inaction.

1. The first characteristic is what Pawlik describes as a low "signal-to-noise" ratio. The "signals" of climate change (e.g. an average temperature increase of $0.1^{o}C$ in a year) are much smaller than the yearly, seasonal and even daily changes in temperature (the "noises") experienced by individuals. In addition to reducing people's inability to perceive climate change, this characteristic is also responsible for increasing public misunderstanding (Gowda et al, 1997).

2. Pawlik (1991) suggests that the temporal difference between the causes of climate change (human actions which release CO_2) and effects (such as changes in average global temperatures) are too long to allow any behaviour modification to take place as a result of positive or negative feedback.
3. The increase in extreme weather events associated with climate change, such as hurricanes, is unlikely to register with individuals due to the fact that even though their relative frequency will increase, they will still be a rare occurrence.
4. Climate change will impact most severely on people who are far removed from the individual in time and/or space (for residents of the UK, this may be those in developing countries or future generations). Human social learning, in this case the engendering of responsibility for contributing to climate change, cannot take place if those affected are not in viewable proximity (Ibid.).
5. Pawlik describes the final characteristic as "low subjective cost-effectiveness of environment-conserving behaviour". This point is best illustrated by an example. The negative impact on individual comfort when turning the heating off is perceived as much greater than the positive impact on CC mitigation. This is the case with much behaviour that is responsible for causing climate change such as getting public transport to work rather than taking the car.

Pawlik (Ibid.) argues that these factors suggest that the traditional ways in which human behaviour is modified are unlikely to apply in the case of climate-change-related behaviours. The psychological perspective described above implies that humans will only be able to know the impacts of their actions if they are informed of their actions. If soft measures, such as changing attitudes (Halpern et al, 2004), are to be used to mitigate climate change, this implies a massive role for psychological theory and communications practice.

Gowda et al (1997) advocated the provision of better educational materials that could prevent the public from misunderstanding the science behind climate change. Other studies from the school education literature advocate a similar approach. Koulaidis & Christidou (1999) used semi-structured interviews (two interviews per pupil) to look in-depth at how eleven and twelve year old school students conceptualise the greenhouse effect (GHE). Their analysis identified six models, all of which were in some way scientifically incorrect or incomplete, despite the fact that each student had access to materials describing a simple, correct representation of the GHE. Some pupils used concepts from more than one model in their interpretation (including aspects of the correct model supplied by the researchers). The main misconception related to the causes and effects of ozone depletion versus those of climate change. Based on the examination of pupils'

conceptualisations and in order to ensure that the GHE is taught accurately, it was recommended that a number of scientific facts need to be communicated in school lessons (Ibid.) These include: distinctions between the properties of UV radiation and radiation of other wavelengths; description of the uniform diffusion of gases in the atmosphere; distinction between the Sun's and the Earth's black body emissions; and distinctions between the effects of ozone and greenhouse gases in different parts of the Earth's atmosphere. Koulaidis & Christidou (1999) propose that these facts should be taught simplistically to reduce confusion, producing students that are correctly versed in climate change science.

Anderssen & Wallin (2000) describe research in Sweden with three different age groups, where answers to three open-ended questions were analysed quantitatively. The questions were about what the greenhouse effect is, its impact on society and the consequences of ozone layer depletion. They found that pupils mixed up these two global environmental issues. However, results showed that many correct concepts were known 'between' the sample population (i.e. some children know certain facts and others know different facts). The analysis led to the following recommendations for future teaching practice: by splitting the class into groups and having open discussions or presentations, concepts can be challenged and the sum of the group's knowledge can be accumulated, utilising peer education as a mechanism for learning.

Boyes & Stanisstreet (1993) carried out research in the UK and provide further evidence of the misconception between climate change and ozone depletion in terms of both causes and impacts. In their factor analysis of agreement or disagreement with 36 factual statements about global warming they discovered that school pupils held certain underlying conceptions; eight factors were identified from the analysis of answers to these 36 statements. The authors labelled one of the factors 'Ozone depletion' and the statements which loaded highest on this factor showed that a majority of pupils thought that climate change was caused by UV radiation, which itself was increased by the ozone layer hole. They also suggested that spray cans caused climate change and that global warming would lead to an increase in skin cancer. In relation to the debate about the need for scientific understanding, Boyes & Stanisstreet state:

> "We would suggest… that clarity of comprehension is likely to be of increasing importance. If the most pessimistic predictions about global pollution materialise, more extreme actions with profound effects on lifestyle in industrially developed countries, perhaps enforced by rigorous and restrictive legislation, will be needed. In this case, we may well need a more logical persuasion of the consequences of inaction, and a pre-educated electorate may prove advantageous"

(Boyes & Stanisstreet, 1993)

These conclusions suggest that Anderssen & Wallin (2000), Koulaidis & Christidou (1999) and Boyes & Stanisstreet (1993) support Gowda et al's (1997) contention about the need to ensure a public that is literate in the scientific background of climate change. However, Bulkeley (2000) provides another view on the debate about whether or not to intervene to increase public understanding of climate change science. She used the city of Newcastle, Australia as a case study and discovered that, via questionnaires and focus groups with school pupils and their parents, in line with the research highlighted above, her sample of the general public had little knowledge of the scientific facts behind climate change and tended to confuse the issue with ozone depletion. The information deficit model (described in section 2.2.2) suggests that lack of public knowledge should lead to lack of action, but Bulkeley (Ibid.) points out that in Newcastle there have been successful climate change initiatives despite public misunderstanding of its scientific aspects. She concludes that detailed scientific understanding of climate change may not be necessary for the creation of successful mitigation strategies, a finding in direct contrast to the conclusions made by Gowda et al (1997) and others. Bulkeley (2000) argues that climate change is sometimes conceptualised by individuals as one issue amongst a whole range of ways in which human beings are damaging the environment. As Thompson & Rayner (1998) point out "in this sense, climate change and ozone depletion are the same thing: they are members of the category of environmental insults deriving from industrial society", a concept Bostrom et al (1994) call "fuzzy environmentalism". Bulkeley (2000) sees fuzzy environmentalism in a positive light as it enhances individuals' responses to climate change, whereas Gowda et al (1997) see it as one amongst several problems that increase public misunderstanding. Bulkeley (2000) suggests that by simply learning that carbon dioxide is the main contributory factor in climate change, which is created by burning fossil fuels, the public can address the issue via their actions. Bulkeley (Ibid.) argues that a broad-ranging knowledge of the science is unnecessary. Dissemination of information from experts and policy-makers to the public and vice versa can ensure both scientific and lay knowledges (such as impacts on local land use) feed into mitigation policies. Inclusive strategies can be devised that bridge the gap between local actions and global consequences.

Oppenheimer & Todorov (2006) and Baron (2006), support Bulkeley's (2000) contention that bringing impacts down to a local level and involving the lay public in decision-making about climate change is important in increasing the chances of behaviour change. Oppenheimer & Todorov (2006) suggest that by framing climate change in a manner that is locally and personally relevant, citizens may be more likely to adopt a range of pro-environmental behaviours including the purchase of environmentally-friendly products such as compact fluorescent light bulbs or even high-

fuel-economy vehicle. This, in turn, may lead to attitudes that support the introduction of more stringent governmental policies on climate change (Ibid.). In relation to the three case studies considered here, the UKCCCI adopts a strategy similar to that highlighted above, using the bulk of the project's funds for the Climate Challenge Fund (CCF) to bring the communication down to a more local level.

2.5 Literature review summary

Human action that has an impact on the environment is described as "environmentally significant behaviour" or "ESB" (Stern 2000a). By modelling the factors that influence ESB, we can identify methods to influence how individuals act. As human action is accepted as the cause of at least some proportion of climate change, this modelling can help identify techniques that attempt to achieve emissions reductions. Several theories of behaviour have been applied in environmental psychology, including the theory of planned behaviour (Ajzen 1991), the theory of interpersonal behaviour (Triandis, 1977) and value–belief–norm theory (Stern et al, 1999), which is based on norm-activation theory (Schwartz 1977). This body of research suggests that ESB is influenced by complex combinations of variables. Stern (2000a) suggests that these variables fall into four broad categories: attitudinal factors (such as norms, beliefs and values); contextual factors (such as available time, monetary cost and availability of resources); personal capabilities (which include skills and knowledge); and habits. Furthermore, the influence of each of these types of causal variable varies depending on the behaviour in question (Gardner and Stern 1996, Stern 2000b). There is much in the literature (e.g. Fahy 2005, Kollmuss and Agyeman 2002) about the inconsistencies between what a person thinks and feels and how a person behaves. This mismatch has been referred to as the "value–action gap" (e.g. Barr 2006) and is unsurprising given the range of causal variables described above.

How people perceive climate change is a key factor in behavioural intent, so making perceptions more positive is an important method for mitigating the problem. Recent years have seen ever more projects attempting to influence how people think, feel and act in relation to climate change, at least in the UK and US. However, most of the research that has been carried out on these "climate change communications" has been in the US (e.g. Baron 2006, Dunwoody 2007, Leiserowitz 2006, Pratt & Rabkin 2007) and, as Moser and Dilling (2007, 509) point out, there is a "need for cross-national, cross-cultural comparisons of [climate change] communication and social change efforts, and of societal responses". Such an effort would help to establish the extent to which communications that might be effective in one context might also be effective in other contexts.

The literature review has highlighted many recommendations regarding how to carry out communications so that they have a significant effect on people's perceptions of climate change. Devine-Wright et al (2004), Uzzell (2000) and Bulkeley (2000) advocate bringing climate change issues down to a local level so that individuals can see how it may impact on their everyday lives. Such a methodology, where the context in which climate-related behaviour operates is emphasised in communications, may help engender pro-environmental responses in individuals and bridge the gap between local causes and global impacts. Pruneau (2003) suggests that it is important to increase self-efficacy at the same time as highlighting actual behaviours that will reduce individuals' impact on the climate. Ballantyne & Packer (2005), Falk (2005) and Devine-Wright et al (2004) agree that taking part in learning experiences in non-formal settings, such as co-operative learning environments, is more likely to impact on people's perceptions. Similarly, Anderssen & Wallin (2000) identified peer education as an important tool in climate change education. The literature review also highlights a study by Barr & Gilg (2006), which recommends grouping a target audience for communications by attitudinal variables and targeting each group with varying messages. Consequently, there are a large number of practical recommendations for climate change communications in the literature, based on an analysis of real-world projects.

Given that the UK has signed up to international agreements, such as the Kyoto Protocol, some responsibility for implementing emissions reductions lies with government. Collins et al (2003) describe four ways in which government can persuade individuals to act more pro-environmentally: adopting more stringent legislation; using the market to influence the price of goods and services so that the more environmentally friendly option is favoured; providing information upon which consumers can make purchasing decisions; and utilising a marketing approach to win hearts and minds. It is the latter approach that is important in this thesis, which uses three government-funded communications projects as case studies.

2.6 Research gaps

Based on the literature review conducted and described above there are several gaps in the academic research that this thesis aims to address. Much of the research into climate change communications conducted to date has been in a US context (i.e. Bostrom & Lashof, 2007). As Moser & Dilling (2007) point out, there is a need for a UK-based study of practical climate change communications initiatives, so that best practice can be recognised and techniques, which could be applied in other contexts, can be identified. The studies by Ereaut & Signaut (2006, 2007) went some way towards this but did not consider the UKCCCI (which was the biggest project of its kind in the UK) and did not present 'before' and 'after' survey results as part of a longitudinal analysis. As such, an assessment of differences in perceptions before and after UKCCCI communications

interventions would fill this gap in the literature. Given the large amount of funding supplied to projects under the UKCCCI it is also important to consider whether the devolution of communications was actually an appropriate strategy. A number of strategies for practical environmental and climate change communications have been noted in section 2.5 and it would be interesting to find out if these recommendations are appropriate in the current context in the UK.

Barr & Gilg (2006) considered the utility of breaking down the target audience for environmental communications into behavioural groups in order to target different sectors with different types of information, and found this a useful methodology for practical projects that aim to change perceptions and behaviour. However, time and budgetary constraints and availability of expertise will not always allow practical projects to conduct the research necessary to produce such behavioural groups. Socio-demographic variables can be used to divide a target audience into groups and if perceptions differ between these groups of individuals, such variables could be used to target different messages to different groups under a single communications project. Consequently, research into the variability of perceptions between groups of people within a single target audience would be a worthwhile contribution to the current body of research.

Studies of public understanding and knowledge of climate change have been conducted in the past (e.g. Kempton, 1991; Bulkeley, 2000) and have largely considered the extent of individuals' knowledge of the scientific facts associated with the subject (Devine-Wright et al, 2004). These studies have generally involved questionnaire surveys rather than qualitative approaches (Whitmarsh, 2009a). Additionally, given the increasing media interest in the issue in recent years (Ereaut & Signaut, 2007) and the relative increase in exposure to climate change information, there is a need to revisit public understanding to see what effect this increase in information availability has had. This would also have a practical benefit as it would assist future initiatives or projects that aim to influence individuals' perceptions. A qualitative study of climate change perceptions would provide a different perspective and sit alongside existing quantitative evaluations.

3. Methodology

3.1 The two research methods

3.1.1 Introduction

This chapter describes the overall methodology adopted for this thesis. Broadly speaking, data were collected in two different ways: a qualitative questionnaire survey; and a number of qualitative interviews using conceptual content cognitive mapping (3CM). Different analysis techniques were used for the different datasets, which were used to answer the research questions noted in chapter 1 and below. As much of the data collected for the thesis was related to the three case study projects, they are described in the next section.

Following the account of the case studies, section 3.2 describes the qualitative 3CM data collection and analysis, which was used to study people's perceptions of climate change. Qualitative data were also collected specifically relating to the three case studies of climate change communications; participants were asked directly about the projects they had taken part in to identify recommendations for future communications. This data collection is also described in section 3.2.

In section 3.3, the quantitative data collection is described. The rationale for using these methods is explained in relation to the methodological literature and the practical limitations experienced when working with partner organisations. The quantitative data collection served a dual purpose: to answer the research questions identified for the present thesis; and to form the basis of evaluation reports for the case studies, which had to be submitted to Defra by the partner organisations. The researcher and the management committees sometimes had different ideas about the outcomes of the evaluation and how these could be achieved. The variation in quantitative data collection methodology is therefore a reflection of the differing desires of the management committees for each of the case studies and the nature of the target audiences (e.g. the target audience for the C-Change project was young people aged 11-21 years whereas 'Everybody's talking about climate change' aimed to reach all ages). The methodologies described here are directly related to chapters 4 and 5, which answer the research questions under the two broad aims of the thesis.

In order to provide clarity for the reader, each of the research aims and objectives are noted below and the dataset used to answer each question is highlighted. This is because each of the broad research aims drew from both qualitative and quantitative datasets.

Overarching aim of the research How can communications be designed to impact effectively on individuals' perceptions of climate change?				
Aim 1 – Understanding perceptions of climate change		**Aim 2 – Evaluating the effectiveness of climate change communications interventions**		
RQ1 How do individuals perceive climate change?	**RQ2** Do perceptions of climate change differ at national and more local levels?	**RQ3** Do individuals' perceptions of climate change differ after taking part in specific communications projects?	**RQ4** Can value be added to communications campaigns by segmenting the target audience using socio-demographic variables?	**RQ5** What do people, who have taken part in specific climate change communications, think about the interventions?
Dataset Analysis of empirical qualitative 3CM data collected by the researcher	**Dataset** Comparison of national perceptions (data collected by Defra) with regional perceptions (empirical data collected by the researcher for the 'Everybody's Talking' project)	**Dataset** Comparison of 'before' and 'after' empirical data from the three case studies, collected by the researcher	**Dataset** Analysis of empirical data collected by the researcher for the 'Everybody's Talking' project	**Dataset** Template analysis of empirical qualitative material collected by the researcher

Table 3.1: Details of which datasets have been used to answer each research question

3.1.2 A Detailed description of the case studies

3.1.2.1 'C-Change'

The C-Change project was headed by the Woodcraft Folk (WF), an "educational movement for children and young people, which aims to develop self confidence and activity in society, with the aim of building a world based on equality, friendship, peace and co-operation" (Woodcraft Folk, 2006). De Montfort University (DMU) and the Centre for Alternative Technology (CAT) were partners in the project and the target audience was people aged 11-21. The entire project was designed by a steering committee of twenty young people, assisted by a management committee with representation from all the three project partners. The events to be delivered were not specified in the application for funding to Defra and the young people on the steering committee were recruited after confirmation that the application had been successful. The steering committee

met at the start of the project and discussed and agreed the events. The key method of engagement was through peer education. C-Change received just over £250,000 funding and used some of the budget to employ two full-time staff members to oversee the project. C-Change aimed to "engage young people who have some knowledge and concern about climate change in raising the awareness of their peers" (C-Change, 2008a). This was done through a number of communications events, which had a climate change focus and were designed to appeal to the young target audience. In addition to the events, a central website (www.switchonswitchoff.org) was also developed, which included general information about climate change, dates and times of all the events, photographs and blogs. The target audience was the individuals who attended each event but it is important to note that, because many of the events were open to the public, it was not known beforehand who that would be (in terms of numbers, demographics etc.).

Film Festival

From March to July 2007, the first C-Change event took place. A group of young people learnt about climate change from members of the Woodcraft Folk and then made and edited their own film, which was designed to appeal to the target audience of young people aged 11-21. The film was shown at the Co-op Young Film-makers Festival in Bradford, West Yorkshire. After the event the films were placed on the C-Change website, along with a guide to help other people create their own climate change video. Attendees at the Bradford event were invited to discuss their views on climate change in a Big Brother-style 'Diary room'.

'Face your elephant' tent

The 'Face your elephant' (FYE) tent was described by C-Change as

> "An information tent for young people about climate change. Step inside for a climate change experience to change your life. The tent will be crammed with information, activities, tea, sofas, crafts, games, pretty things, graffiti, and a chance for you to find out what climate change is really all about"
>
> (C-Change, 2008b)

The tent toured various events throughout the summer of 2007 including the Glastonbury music festival in Somerset, The HUB Urban Youth Festival in Liverpool, the Thames Festival in London and the International Scouts Jamboree held in Essex, and attempted to provide climate change advice and information in a fun, interactive way (for example, by providing a graffiti board on which attendees could draw or write what they think about climate change).

Party for the Planet

This event was held at Clapham Common, London, on a Saturday afternoon during the summer of 2007. All activities had a climate change focus and included stalls (e.g. selling locally produced food), crafts (advocating re-using and recycling materials), games, demonstrations (e.g. street performers and storytellers), exhibitions (e.g. renewable energy technologies and photographs showing our changing climate) and entertainment (e.g. a cinema showing climate-related films powered by renewable energy). This event was designed to provide the attendees with bite-size information about climate change.

Battle of the Bands

A battle of the bands (BotB) competition took place on the same day as the Party for the Planet, and the acts were interspersed with information about, and performances related to climate change (e.g. climate change poetry). A competition involving approximately 70 bands was held beforehand on the C-Change website and ten acts were chosen to perform at BotB after an online ballot. Anyone interested in C-Change had one online vote to state which bands they thought should be allowed to perform at the BotB. The online competition was designed to push traffic through the C-Change website and engage more people with the project.

Club nights

Early in 2008, C-Change held events at nightclubs in four different English cities, with audio-visual information about climate change and specially designed beer mats with climate change messages. The advertisement read:

> "This winter C-Change is touring a [Video Jockey (similar to a disc jockey, but plays both music and videos)] set to visit 4 cities around the UK. Come along and dance away whilst watching climate change in AV format! Every night a different mix of images and video will be woven together to the music to show climate change as you've never seen before"
>
> (C-Change, 2008[c])

These events were designed to appeal to the older age group within the target audience as night clubs can only be attended by people aged over eighteen years.

C-Cast Conference and radio broadcast

A Conference for approximately 60 young people from around London was held at the Greater London Assembly (GLA) in January 2008. Activities included presentations, workshops, debates and discussions with experts. In order to allow more people to be involved with the event, a 24-

hour radio show was broadcast on the Internet, with sections being played on several community radio stations throughout the UK. The radio shows included interviews with environmental and scientific experts such as environmentalist writer and journalist George Monbiot and television presenter Adam Hart-Davies.

In recognition of their work on the C-Change project, the Woodcraft Folk were crowned the National Champions at the National Energy Efficiency Awards in December 2008 (National Energy Efficiency Awards, 2008). In addition to the overall title, the Woodcraft Folk also won the 'Education and Awareness Raising' category and a member of the steering committee was crowned the 'Young Carbon Champion' (Ibid.).

3.1.2.2 'Everybody's talking about climate change'

The 'Everybody's talking about climate change' campaign (from hereon referred to as ET or 'Everybody's Talking') was run by the Nottinghamshire and Derbyshire Local Authorities Energy Partnership (LAEP), an organisation that includes representation from all the Local Authorities in the two counties. The project was ambitious in scope as it attempted to reach all the people within the two counties. Just under £380,000 funding was received to design and administer the campaign and part of this was used to fund a full-time Project Co-ordinator, who was based at Derbyshire County Council.

The counties of Nottinghamshire and Derbyshire are both in the East Midlands region of England. According to National Statistics (2001) there are 956,000 people living in Derbyshire and 1,015,000 in Nottinghamshire, which gave the ET campaign a target audience of approximately two million people. Roughly a quarter of citizens of both Nottinghamshire and Derbyshire live in the two cities that give the counties their names. The project aimed to "change attitudes and raise awareness of climate change" (Everybody's Talking, 2007) amongst the residents of the two counties through a variety of means including: a touring campaign vehicle that attended over 100 events and gave out information and advice relating to climate change and energy efficiency; support for partner organisations, such as the Groundwork Trust, in attending over another 100 events; two high-profile launch events (one in each county), which were attended by local celebrities and politicians; a campaign website (www.everybodys-talking.org) providing general information about climate change, a number of interactive links such as quizzes and games, and details of any upcoming events; a targeted media campaign which included advertisements on local radio stations and in the local press; articles in Local Authority publications, which were sent to all two million residents in the two counties; and innovative methods of communication with Local Authority staff including payslip inserts and banners on intranet home pages.

A central tenet of Everybody's Talking was to get people to pledge to a number of actions that would reduce their carbon footprint: over 10,000 pledges were collected (people did not have to pledge to all the actions). The actions were:

- take a shower instead of a bath
- replace 3 light bulbs with energy saving ones
- top up loft insulation to 270mm (10.5 inches) and install cavity wall insulation
- turn the tap off whilst brushing teeth
- switch off appliances at home and not leave them on standby
- put a water saving device in the toilet cistern
- share car journeys and cycle, walk or take public transport to replace those car journeys at least once a week
- buy more local seasonal produce
- boil only the water needed, rather than heating a full kettle every time
- recycle more and use a reusable bag when shopping rather than plastic carriers

(Everybody's Talking, 2009)

3.1.2.3 'The Wellingborough Toolkit'

The Local Strategic Partnership (LSP) for the Borough of Wellingborough, Northamptonshire, received £6,700 funding to produce and administrate the Wellingborough Toolkit (WT). Two officers at the Borough Council of Wellingborough (BCW) carried out most of the work on a part-time basis as the relatively low level of funding meant that a full-time position could not be covered. According to the initial funding bid, the aim of the project was "to produce a toolkit for local organisations to use to raise awareness of the factual issues surrounding climate change" (Wellingborough Partnership, 2006). A presentation and a range of leaflets were produced, which included details of the causes and impacts of climate change, mocked-up photographs of what the Borough may look like under the influence of climate change and possible solutions. A laptop, projector and screen were purchased and the BCW officers attended various local groups and carried out presentations. In addition, stalls were put up at a local event and in the local shopping centre. Furthermore, a page of the BCW website was dedicated to the Toolkit. Finally, a number of organisations adapted the WT to their own needs.

In recognition of the work done on the Wellingborough Toolkit, the Borough Council of Wellingborough were finalists in the 'Public Sector Category' at the National Energy Efficiency Awards in 2008 (National Energy Efficiency Awards, 2008).

3.1.3 Epistemology

Hughes & Sharrock (1997, 4) describe epistemology as "the enquiry into the traditions of the possibility of knowledge" and Williams & May (1996, 5) state that epistemology is "the branch of philosophy…[that asks] where our knowledge comes from and how reliable it is". In relation to the present research, which adopts a social scientific approach towards discovering the perceptions of individuals in relation to climate change and making recommendations about the most appropriate communication methods, epistemology must be considered because it helps to explain the presuppositions and assumptions upon which the study results are based (Ibid.). This thesis discusses results from two different research techniques: quantitative questionnaire surveys and qualitative interviews. As Guba & Lincoln (1994) point out, quantitative studies in the social sciences are generally based on a positivist model or worldview, whereas qualitative studies are often orientated towards a constructivist position. As there has been much debate across the social sciences concerning the validity and compatibility of these two approaches (Gage, 1989; Tashakkori & Teddlie, 1998), it is necessary to consider their differences here, given that this thesis utilises both approaches in its mixed-method study. The following quote from Hughes & Sharrock (1997) succinctly sums up the reason why epistemology is important to this thesis and to social science research in general.

> "Conceptions of the nature and organisation of social research are often themselves derived from one or other philosophical conceptions about the nature of scientific enquiry. As a result, research approaches and techniques are often developed as implementations and demonstrations of philosophical preconceptions"
>
> (Hughes & Sharrock, 1997, 5)

Initially, consider the quantitative data collection, which, as highlighted above, is based in the positivist tradition of scientific research. Positivism is associated with the scientific method of research and posits that "all knowledge is contained within the boundaries of science" (Reber & Reber, 2001, 549). Positivism suggests that empirical observation of "observable phenomena" (Kolakowski, 1993, 3) is the only legitimate method for describing and studying the world. This epistemological position came from the approach generally adopted in the natural sciences, which aims to discover laws about the universe by observation and experimentation. In order to make social science a more 'scientific' endeavour, positivism also became the favoured method for researching human subjects, until some researchers began to question its applicability and moved towards a more constructivist position. Following analysis of qualitative material, conclusions are

based upon a constructivist view. One of the key points about constructivism (in contrast to the positivist position described above) is highlighted by Reber & Reber (2001, 150) who state that "social constructivists argue… that there is no such thing as a knowable objective reality [and]… all knowledge is derived from the mental constructions of the members of a social system". The key epistemological differences between the two positions are shown in Table 3.1.

Positivism	Constructivism
1. Positivists believe that there is a single reality	1. Constructivist believe that there are multiple, constructed realities
2. Positivists believe that the researcher and the researched are independent	2. Constructivists believe that the researcher and the researched are inseparable
3. Positivists believe that research is free of the values of the researcher	3. Constructivists believe that research is bound by the values of the researcher
4. Positivists believe that research results can be generalised	4. Constructivists believe that generalisation of research results is not possible
5. Positivists believe in cause and effect	5. Constructivists believe that causes and effects cannot be distinguished

Table 3.2: The main differences between positivist and constructivist epistemological positions (after Tashakkori & Teddlie, 1998).

In the context of this mixed-method study, which, it could be suggested, bases the conclusions from the quantitative and qualitative datasets on two distinct epistemological assumptions, it is argued that the epistemological foundations of the two different research methodologies should be viewed as points on a spectrum, from purely constructivist approaches to purely positivist approaches (Tashakkori & Teddlie, 1998). In this picture, the two methods do not have directly opposing epistemologies, but rather base their conclusions on two different sets of assumptions about the nature of research and the world in general. The two studies were designed to complement each other, an approach described as pragmatism (Ibid.). The pragmatist approach allows the researcher to choose from a

> "dazzling array of both qualitative and quantitative methods [and] the decisions regarding the use of either qualitative or quantitative methods (or both) depend upon the research question as it is currently posed and the phase of the research cycle that is ongoing"
>
> (Tashakkori & Teddlie, 1998, 24)

In social scientific research that involves such a complex and broad-ranging topic as climate change, it seems reasonable to choose research techniques from as wide a range of alternatives as are available, rather than discounting a number of possibilities due to epistemological arguments.

Indeed, Brewer & Hunter (1989, 22) point out that "there is now virtually no major-problem area [in social science] that is studied exclusively within one method".

Despite the fact that a pragmatic approach was adopted, the research questions were sufficiently different in their objectives to mean a comparison of results did not represent triangulation as described by Tashakkori & Teddlie (1998, 18): "the use of both quantitative and qualitative methods and data to study the same phenomena within the same study or in different complementary studies". Robson (2002, 373) describes triangulation as "checking the results", a technique not employed directly in this thesis. Rather, the analyses were mutually enhancing and performed to 'sit together' in a single, coherent document.

It is important to note that climate change behaviour can be viewed from the actor's (the person performing the behaviour) standpoint, in that "behaviour is undertaken with the intention to change (normally, to benefit) the environment" (Stern, 2000, 408). It is noted that changing perceptions to be more pro-environmentally orientated is the goal of the wider body of research in which this study sits. It is evident throughout this thesis that the research was conducted with a view to aiding emissions reductions in the long-term and therefore actions that benefit the environment are seen as positive.

3.1.4 Ethical issues

For both studies, participants were briefed regarding what the research was about before they consented to taking part. Subjects were informed that their answers would remain confidential and anonymous and individuals would not be identified personally. As the qualitative study involved the researcher engaging with the subject for a long period, the interviewees were informed of the nature of the research before the interview took place that and asked for consent to proceed and to record the interview for transcription. To make interviewees feel more comfortable, they were told that, as the interview was an exploratory process, there were no right or wrong answers and that they were free to pull out at any stage without explanation. All ethical issues were identified early on in the research process and the study received ethical approval from the De Montfort University Higher Degrees Committee. Throughout both studies, no individuals changed their minds about taking part in the research after beginning the process.

3.2 Qualitative data collection and analysis

3.2.1 The qualitative data

The qualitative data collection adopted a two-stage approach: the analysis of conceptual content cognitive maps (3CM) created by interview participants in relation to climate change; and a thematic

analysis of the semi-structured interview data that referred to the communications the interviewee had taken part in. These two techniques were designed to discover how the interviewees perceived climate change (research question 1) and what they thought about the interventions they had taken part in (research question 5). As the two datasets were collected as part of a single interview, the methodologies are described together here, despite the fact that each dataset is used to answer separate research questions under different broad research aims.

3.2.2 Theoretical considerations

3.2.2.1 Introduction to 3CM

Conceptual Content Cognitive Mapping (3CM) is a technique designed to discover how individuals perceive an issue, by revealing their unique knowledge structure (Austin, 1994; Kearney & Kaplan, 1997). Amtmann (1996) describes 3CM as a tool for studying people's perspectives on an issue which, when they differ between individuals, may function as a barrier to problem-solving. 3CM is therefore used as a technique to both discover knowledge structure and share results to more effectively solve problems. As noted in chapter 2, climate change is a very important, large-scale environmental issue, on which different individuals have varying perspectives. As reported in the subsequent sections below, 3CM has generally been used for decision-making research on relatively small-scale issues, whereas in this thesis, 3CM was used as a tool to discover individuals' perspectives on the much larger scale issue of climate change. The following discussion of 3CM is based on the two papers mentioned above and several other studies (carried out in various contexts and in relation to a variety of issues) that have used and developed the 3CM technique. Not only can the insights provided through 3CM produce individuals' conceptual maps of an issue, they can assist in designing strategies to change perceptions (Austin, 1994).

The technique is an extension of cognitive mapping, which is used to discover how people think about physical space (Kitchin, 1994; Downs & Stea, 1973). 3CM is used to map individuals' thoughts about a non-physical issue, such as the social factors associated with the placement of hazardous waste incineration facilities (Austin, 1994) or to assess what stakeholders see as appropriate forest management (Kearney, 1997; Kearney et al, 1998). Austin's article was the first published study that used 3CM, and it reported that the technique was useful for revealing the perceptions of several stakeholders to one another, in relation to an important environmental decision. The idea behind her study (and several subsequent 3CM studies, highlighted below) was not simply to discover the "content and structure of participants' cognitive representations" (Ibid., 262) about a given issue, but to provide a basis for dialogue and to help all participants in the decision making process to "understand the aspects of the decision" (Ibid., 265). Austin (1994, 263) points out that "the examination of cognitive representations involves individuals who have

recently participated in a decision and can therefore be expected to have a map of the issue under consideration". Similarly, in the present study, people who have taken part in a climate-related intervention will be expected to have a conceptual cognitive map of climate change.

There are two versions of the 3CM methodology: open-ended; and structured. Both implementations have "qualitative and quantitative aspects" (Kearney & Kaplan, 1997) and the open-ended version is "suitable for small sample sizes", which allows "in-depth exploration, whereas the structured implementation permits larger sample sizes" (Ibid.). Consequently, this qualitative study adopted the open-ended procedure, given that it was designed to complement the quantitative study whose methodology was described in section 3.2, which was carried out with a large sample. The two versions of 3CM are often performed in conjunction (e.g. Irvine, 1997), with the open-ended implementation used as an initial study to provide concepts for the structured implementation. Given that this study adopted the open-ended method, it is described in detail in the next section.

3.2.2.2 The open-ended 3CM process in detail

The following list describes the open-ended 3CM process in detail and is based mainly on Kearney & Kaplan (1997), but draws from the methodologies described in several other studies (Amtmann, 1996; Austin, 1994; Irvine, 1997; Kearney, 1997; Lee & Kant, 2006). The interview schedule used for this study is shown in Appendix 2 and was developed from schedules used in the previous 3CM studies noted above. There is a standard outline for a 3CM interview schedule [used by Amtmann (1996), Irvine (1997) and Kearney (1997) and included as appendices in their PhD and MSc dissertations] and this was adapted to the area of study to be addressed by the present research. For this thesis, the interview schedules noted above were used as templates and the specific sections of the process where the subject matter is addressed were amended to consider climate change. In addition, the researcher was able to discuss the process with an academic who had previously conducted a 3CM study[1]. The interview schedule was pilot-tested and this process is described in section 3.2.5.5.

1. The participants are informed of the topic and asked how they would explain the issue to a friend who had never considered it before. For the present research, participants were asked to:
   "Imagine that a friend who has not previously thought about climate change asks you to share your view on the issue. What are the important things you would want to mention?"

[1] The researcher's supervisor was Dr Katherine Irvine, whose study is described below (Irvine, 1997)

2. They are asked to list words or short phrases ('concepts') that describe important aspects of the issue. The researcher writes the concepts down on cards and places them face-up on the table in front of the participant.
3. After the participant has listed all their concepts, they are asked to arrange them into groups ('categories') based on how they think the concepts go together. Participants are free to add more words or phrases at any time and there is no limit on the number of higher order categories.
4. A list of "ideas used by others" (Amtmann, 1996, 81) is offered to the participant and they are asked if they would like to include any concepts from the list in their own map. The further concepts offered to the participant can be generated through exploratory study or from the literature. For this thesis a short exploratory study was used to generate these concepts. Several colleagues of the researcher were asked to name five things they would want to mention to a friend when describing climate change and these data were briefly analysed to produce 14 concepts. The list for this study was 'worrying', 'individual responsibility', 'unavoidable', 'media hype', 'technological solutions', 'nonsense', 'contradictory evidence', 'concerning', 'carbon emissions', 'everyone needs to do their bit', 'political aspects', 'research', 'flooding' and 'better weather'.
5. The participant is asked to label each category, using one or two words to capture the essence of the groups of concepts.
6. The map is photographed or sketched and the concepts are coded: 1 = own generated; and 2 = from the list offered to the participants.
7. Analysis takes place. The types of analyses carried out in other studies are reviewed in section 3.2.2.5 and the actual analysis methodology that was used in this study is described in section 4.1.2.

Kearney & Kaplan (1997) describe in detail the process for carrying out a structured 3CM study.

3.2.2.3 Benefits of using 3CM

There are several benefits to 3CM compared to other qualitative and quantitative research methods:

- participants are able to generate their own concepts throughout the interview and they are not predetermined by the researcher;
- the 3CM process helps individuals articulate, and therefore realise, their own knowledge;
- when compared to quantitative research on similar subjects, several discussion points can be elicited in 3CM that were not identified in the quantitative studies;
- 3CM can be used in a wide variety of contexts; and,

- 3CM is flexible as various additions can be made to the general methodology (for example, Austin (1994) asked participants to label each concept as 'positive' or 'negative').

3.2.2.4 Construct validity of the open-ended 3CM

"Construct validity answers the question of whether or not the measuring device actually measures the construct under question" (AllPsych, 2004). Kearney & Kaplan (1997) state that there are three measures of construct validity for the open-ended 3CM process and that "validation of the technique comes from examining how study results meet [those] expectations" (Ibid.). These expectations are: respondents should be able to differentiate between concepts that form part of their internal representation of an issue and concepts that do not; relationships between concepts should be expressed in terms of 5 ± 2 categories, as the brain has limited channel capacity (Mandler, 1975); and respondents should be satisfied with the process of realising and ordering their own knowledge, given that cognitive clarity is associated with satisfaction (Kaplan, 1978). Both the pilot interviews and the final research interviews were assessed against these criteria using the following process.

- Each transcript was checked to determine whether individuals had added concepts to their cognitive map after being shown the list of concepts mentioned by others. Additionally, respondents were asked after the interview how well the task had enabled them to express their thoughts about climate change (on a scale of one to five, where: 1 = not at all; 3 = somewhat; and 5 = very much).
- The number of categories in each respondent's 3CM was checked to confirm that there were between three and seven categories (i.e. 5 ± 2).
- Post-interview, respondents were also asked if the task clarified their own understanding of climate change and whether they enjoyed the card-sorting task (on a scale of one to five, where: 1 = not at all; 3 = somewhat; and 5 = very much)

In addition to the three main considerations above, Kearney & Kaplan (1997) point out that long-term work (the SESAME approach, named after the Seminar on Environmentally Sensitive Adaptive Mechanisms which has met regularly in the 20 years preceding their paper and includes these authors) suggests that individuals with more expertise in a given area will mention a greater number of concepts and order these concepts to a greater degree. To explore this issue, further questions were added to the post-interview survey, which attempted to quantify the respondents' experience and familiarity with the subject matter. Respondents were asked who their employer was, their job title, whether they were a member of any environmental groups, whereabouts they had engaged with the case study project, if they had seen any other CCF projects and if they had ever calculated their carbon footprint. Additionally, interview transcripts were checked to see if the conversation

gave any evidence of the level of experience the interviewee possessed in relation to climate change issues. This evidence was compared to the number of concepts in the respondent's 3CM and to the interview transcripts (which indicated the level of experience and knowledge the interviewee had).

3.2.2.5 Analysis methods used in previous 3CM studies

A review of MIMAS Web of Knowledge (WoK) using the search parameters "Conceptual Content Cognitive Mapping", "Conceptual Content Cognitive Map" and "3CM Map" produced six academic publications that used 3CM as a research tool in relation to environmental issues. A further four pieces of research - one PhD thesis and three MSc theses - were obtained from directly contacting an academic associated with SESAME, yielding a total of ten relevant studies. These were reviewed to see how open-ended 3CM data were analysed and whether data were analysed in conjunction with any other research method. During this review, it was noted that the PhD thesis mentioned above included the same analysis as two of the research articles discovered through WoK, reducing the total number of 3CM studies to eight. The analysis methods used in each of these eight academic studies are described below.

The first published 3CM study by Austin (1994), the technique for which was developed with Steven Kaplan at the University of Michigan, used the open-ended implementation as a tool to assist decision-making in relation to the siting of a hazardous waste facility. Analysis was purely qualitative, comparing the concepts and categories in different stakeholders' 3CMs. In addition to the mapping element of the exercise, all concepts were coded further by the respondent: concepts were assigned as a positive or negative aspect of the decision; concepts were ascribed a level of importance; and the respondent stated the level of knowledge they considered they had about each concept. This solely qualitative approach was adopted in two other open-ended 3CM studies: Amtmann (1996) used 3CM to obtain the views of two study committees who were involved with 'Wild and Scenic Rivers' in the US and analysed the data generated at interview by looking for "common themes" (Ibid., 30); and Irvine (1997) used "content analysis of both the category name and the individual items [concepts] within each category" (Ibid., 20) in her assessment of private property owners' perceptions of their forested land. A further, broadly qualitative study was carried out by Tilt et al (2007) to assess perceptions of rural character.

Kearney & Kaplan (1997) do not report a study that uses the open-ended 3CM approach; the paper describes the methodology used in open-ended 3CM as a pre-cursor to an explanation of, and a study utilising, the structured 3CM process. However, in a related study which also adopted 3CM as a tool for decision-making, Kearney et al (1998) use open-ended 3CM to obtain the perspectives

of three stakeholder groups involved in forest management: public sector forest service employees; private sector timber industry employees; and environmentalists. The analysis was an extension of the purely qualitative analyses of open-ended 3CM data carried out by Austin (1994), Amtmann (1996) and Irvine (1997) and involved a mixture of quantitative and qualitative techniques. Kearney et al (1998) identified themes from the 3CM data using both hierarchical cluster analysis (Johnson, 1967) and qualitative content analysis. This yielded 11 major themes that were shared by at least two participants. The authors discovered that the three stakeholder groups shared similar opinions and values, their values were more broad-ranging than one might have expected and their views did not conform to common stereotypes. However, analysis of open-ended survey questions showed that respondents did stereotype the other stakeholder groups, emphasising the need for a collaborative tool, such as 3CM.

In a very similar study to Austin (1994), this time conducted in Canada, Lee & Kant (2006) used 3CM to ascertain the "forest values" of four different groups involved in sustainable forest management (an "aboriginal people" group was included along with the Canadian equivalent of the three groups interviewed in the Austin's study). In addition to applying hierarchical cluster analysis to identify the themes that make up the "forest values universe" (Ibid., 515) of the entire sample, the authors used quantitative methods to identify the existence of stereotyping amongst stakeholder groups. They asked each respondent to rank the clusters in terms of importance to themselves as individuals and in terms of how they perceived the other groups to rank the clusters. These data were explored using the non-parametric sign test to identify overall group rankings and differences between perceived and actual rankings. The overall group rankings were similar but the rankings of individuals within groups did differ on some occasions. Lee & Kant (2006) concluded that, even though conflict of opinion about appropriate forest management is likely to be present (Bengston, 1994), discovery and discussion of stakeholders' values can increase the likelihood of resolution.

Two studies used 3CM as a tool to discover the psychological dimensions of private forest ownership (Irvine, 1997; Tikkanen et al, 2006). These studies, although exploring small-scale environmental issues, were in a sense similar to this thesis, in that they were not orientated around a decision-making process. Irvine's (1997) work on open-ended 3CM data was highlighted above and did not include quantitative analysis: the quantitative analysis in her study was carried out with closed 3CM data. However, Tikkanen et al's (2006) study did use a mixture of techniques for analysing open-ended 3CM data. A sample of Finnish forest owners were asked what their objectives were for the ownership and management of their land. The open-ended 3CM data were coded qualitatively by merging 3CM concepts into 'objectives' for land management, if the researchers thought that they reflected the same underlying intention. From a total of 220

concepts, which were ascertained from 23 interviews, 28 objectives were identified and subjected to hierarchical clustering, which produced five main groups of objectives. These objectives were classified, providing a list of the main management goals of Finnish forest owners.

In conclusion, open-ended 3CM has mostly been used as a research tool to assist decision making in relation to a relatively small-scale environmental issue, about which stakeholders opinions, attitudes and knowledge may differ. It has not before been applied to a macro-scale environmental issue such as climate change. 3CM was chosen for this study because: it was an established research method and had not previously been used to study climate change; and it was a technique that would yield data showing what perceptions individuals have about climate change. Additionally, the nature of the data collected from 3CM interviews opened up a variety of analysis techniques. The studies described above include examples where open-ended 3CM data has been analysed purely qualitatively (i.e. Austin, 1994; Irvine, 1997), in a sequence involving qualitative then quantitative analysis (i.e. Tikkanen et al, 2006) and using a mixed qualitative-quantitative approach (i.e. Kearney et al, 1998). This wide-range of options maximised the potential analysis methods available to the researcher. As mentioned previously, the communications projects used here as case studies attempted to influence individuals' perceptions, such as attitudes, beliefs, values and understanding. As Austin (1994, 263) points out, 3CM can be used for "understanding environmental knowledge and beliefs", and is therefore an ideal technique for realising the goals of this qualitative study

3.2.3 Practical considerations

The survey data from the quantitative study had to be used for both this thesis and for evaluation reports for Defra, so the management committees for the three case study projects were heavily involved in the design and implementation of the data collection (see section 3.3.3). However, as qualitative evaluation was not considered a key part of the Defra report, the management committees were happy not to be involved directly. The C-Change management committee decided that they did not want the people they had engaged with to take part in this qualitative study, because they did not wish to detract from peoples' enjoyment of the events (either at the time of the event, or at a later date). Therefore, qualitative data were collected only for the ET and WT case studies and the research methodology was much more under the control of the researcher. Logistical assistance was received from the ET and WT management committees.

3.2.4 Aims and objectives of the qualitative data collection

The qualitative data were collected and analysed to answer two of the research questions. Firstly, under aim 1 (understanding perceptions of climate change) 3CM data analysis was used to answer

research question 1: how do individuals perceive climate change? This data analysis is reported in the first part of chapter four. Secondly, under aim 2 (evaluating the effectiveness of climate change communications), template analysis was used to answer research question 5: what do people, who have taken part in specific climate change communications, think about the interventions? This data analysis is reported in the latter part of chapter five.

3.2.5 Method

3.2.5.1 Overview of the 3CM data collection and analysis methodology

3CM data provided individuals' cognitive maps of climate change and were collected as part of a broader qualitative interview (Austin, 1994). 3CM analysis followed the procedure described in section 4.1.2. Consequently, a combination of qualitative and quantitative techniques were used for the analysis of the 3CM data collected during the interviews, with the 3CM concepts initially being categorised through qualitative methods and then subjected to quantitative analysis (details of the analysis and explanation of the techniques used are reported in chapter 4).

3.2.5.2 Overview of the template analysis

In addition to the 3CM analysis described above, a template analysis was carried out using all the data from the interviews that referred to the interventions (research question 5). As can be seen from the schedule presented in Appendix 2, the interviews were split into two different sections. Firstly, the 3CM task identified individuals' perceptions of climate change. After the interviewees had created their cognitive map, several questions were asked specifically relating to the intervention they had taken part in. The latter dataset was combined with any data from the 3CM task that referred to the intervention and subjected to template analysis, using Kitchin & Tate's (2000) methodology, which was based largely on the techniques described by Dey (1993).

The following procedure was used for this analysis

1. Data collection. Data were collected using the interview questions shown in appendix 2, following the creation of respondents' 3CMs.
2. Transcription. The interviews were transcribed in their entirety (including the 3CM section) and all references to the interventions were collated into single documents. This included the latter section of the interview, which referred specifically to the interventions, and any references made to the intervention in the 3CM section of the interview.
3. Open coding. Notes were made whilst the interviews were transcribed from the tape recorder including memos (notes to oneself), etic themes (themes derived from background information and reading about the subject) and emic themes (themes derived from the actual data) (Kitchin & Tate, 2000).

4. Coding. The material was studied to identify common themes across participants and each section of interview data was assigned a code.
5. Template formation. The codes were refined and organised into a template.
6. Reporting. The themes were reported and quotes from the interviews were used to provide examples and context.

3.2.5.3 Transcription

The actual verbatim conversations were not analysed as they would have been if conversation or discourse analysis (Tesch, 1990) had been used, but all the interviews were fully transcribed. The transcripts were used to provide context and help explain to the researcher the nature of the 3CM concepts elicited by the respondents. The interviews were transcribed using Psathas' (1995) method. In the examples below, 'INT' refers to the interviewer and 'RES' refers to the respondent.

1. Overlapping speech turns are enclosed in [ ]

INT: So, again, raising [awareness]
RES: [I think so], yeah.

2. Contiguous utterances are indicated by =

INT: We've talked about the impacts on the ice caps and the sea levels =
RES: = Yep.

3. Cut off speech turns, where one speaker interrupts another, are indicated by –

INT: OK, so you've talked about -
RES: - I mean the wind turbines, I think, are really good.

4. Emphasis is indicated by highlighting the word(s) in italics

RES: Not *strongly*, I don't believe.

5. Non-verbal actions indicated by (( ))

RES1: Awareness again, I would think. Making people aware and ((pause)) scaring the socks off people.

3.2.5.4 Participants

Participants were recruited through different methods for each of the projects and the small number of potential respondents meant that this was partly ad-hoc. Individuals were chosen based on several factors including: their answers to the questionnaire administered in the quantitative study

(if available); how convenient it was to carry out the interview (the nature of the projects meant that potential interviewees were dispersed geographically); the individual's availability on interview days (to minimise travelling time and costs, participants living close to each other were interviewed on the same day); and the aspect of the intervention or campaign that the individual had been involved in (for example, the ET campaign engaged with people on the campaign website and via the mobile advice centre). This was done in an attempt to gain a diverse sample in terms of demographics and opinions.

Given that the quantitative study carried out for the ET campaign surveyed a representative sample of the entire project target audience, there was no way of ascertaining whether survey respondents had actually taken part in the interventions. Therefore, a list of 100 individuals who had engaged with the project and supplied their email address (either online via the website or in person whilst filling in a pledge form at the mobile advice centre) was supplied by the management committee. All 100 people were emailed; the research was explained and individuals were asked to commit to being interviewed. This yielded a list of fourteen potential participants, two of whom lived outside the two-county target area and were discounted. The twelve remaining people were emailed and asked to specify where they would like the interview to take place and when they would be available. The researcher matched the location of the individuals to each other and arranged up to three interviews per day. All interviews took place between the 5th and 27th November 2007 and the locations included the interviewee's home, a meeting room at an individual's place of work, a university library and a staff canteen. Table 3.3 provides information about the interviewees.

Interviewee	Age	Gender	County of residence	Location of interview	Engagement with ET
1	56	Male	Derbys.	Respondent's workplace	Email
2	28	Male	Derbys.	Respondent's workplace	Local authority
3	27	Female	Notts.	Local café	Internet
4	38	Female	Notts.	Local library	Unsure
5	41	Male	Derbys.	Respondent's workplace	Email & website
6	41	Female	Derbys.	Respondent's workplace	Website & pledge bus
7	57	Male	Derbys.	Respondent's home	Website & pledge bus
8	50	Female	Derbys.	Respondent's home	Pledge bus & website
9	30	Female	Derbys.	Respondent's workplace	Pledge bus & website
10	35	Male	Notts.	Respondent's workplace	Pledge bus & website

Table 3.3: Demographic details of the 'Everybody's talking' interview participants.

For the WT interviews, participants were either members of Wellingborough Council Staff or local community groups. Community group interviewees were recruited via the questionnaire, by adding a question asking those who were willing to be interviewed to write their name and telephone number on the survey instrument. Eight individuals responded positively and were telephoned to arrange an appointment. Upon further explanation, four dropped out and interviews were carried out with the remaining respondents. Interviews took place at the interviewee's home or at the venue of the community group. The other six interviews were carried out with Wellingborough Borough Council staff and all took place on council premises. Half the interviewees were recruited in the same manner as the community group respondents and half were organised directly by the WT project manager. Table 3.4 provides information about the interviewees.

Interviewee	Age	Gender	BCW employee or local community group	Location of interview
1	47	Female	Local community group	Community group venue
2	69	Male	Local community group	Respondent's home
3	71	Male	Local community group	Respondent's home
4	41	Male	Local community group	Respondent's home
5	55	Female	BCW employee	Respondent's workplace
6	57	Female	BCW employee	Respondent's workplace
7	47	Female	BCW employee	Respondent's workplace
8	35	Male	BCW employee	Respondent's workplace
9	44	Female	BCW employee	Respondent's workplace
10	32	Female	BCW employee	Respondent's workplace

Table 3.4: Demographic details of the Wellingborough Toolkit interview participants.

3.2.5.5 Pilot interviews

Three pilot interviews were carried out with individuals who had seen the WT presentation. Part of the target audience for this intervention was the staff at Wellingborough Borough Council and they represented the first group of people who received the presentation. Interviews were conducted using a pilot schedule, transcribed and briefly analysed. Furthermore, interviewees were asked for their comments on the process, particularly with reference to their engagement and enjoyment and how the 3CM maps actually reflected their knowledge, thoughts and feelings. This led to one major modification of the interview schedule: an increase in the number of semi-structured interview questions asking about the intervention itself. This was mainly due to the fact that the intervention barely featured in the pilot interviewees' cognitive maps of climate change and in order to find out more about the impact of the communications, it was necessary to be more direct in the questioning. As mentioned previously, the pilot interviews also met the measures of construct validity for 3CM highlighted in section 3.2.2.4.

3.3 Quantitative data collection and analysis

3.3.1 The quantitative data

The three case studies explored in this thesis were projects that attempted to change individuals' perceptions of climate change. Each project defined a target audience and designed their own interventions before receiving funding or during the very early stages of the project. The first objective of the quantitative data collection was to provide data to test whether the interventions had changed perceptions (research question 3). This involved surveying members of the target audience before and after they had taken part in the different interventions and using statistical analysis to compare the results. The second objective was to provide a dataset that could be analysed to show whether perceptions differed by socio-demographic group within a single target audience (research question 4). Thirdly, a dataset was needed so that perceptions of climate change at a national level (COI, 2007) could be compared to more local perceptions (research question 2). A comprehensive regional survey of residents of Nottinghamshire and Derbyshire was carried out in relation to one of the case studies ('Everybody's talking about climate change'), which was used for these two latter purposes. Furthermore, the results from this latter survey were analysed to provide an inferred measure of worldview in relation to climate change (Fishbein & Ajzen, 1975) and responses to these scale items were collected and compared before and after the interventions. As research questions 2, 3 and 4 all relied upon the quantitative data collected through several questionnaire surveys, the data collection methodologies are grouped together here.

3.3.2 Theoretical considerations

As noted in chapter 2, there are several examples of both academic and non-academic studies and surveys that aim to obtain information about public perceptions of climate change (DfT, 2006). As such, there are a vast range of peer-reviewed or previously-used questions available, which tap individuals' perceptions. Amongst these studies there are several that do not take single, discrete measurements, but collect data at regular intervals and monitor any changes over time. These include the Defra surveys of public attitudes to quality of life and the environment (Defra, 2002, 2007) and the Central Office of Information's (COI) nationally-representative surveys conducted on behalf of Defra as part of the UK Climate Change Communications Initiative (UKCCCI, see chapter 2 for more details of these surveys). In the latter case data were collected bi-annually, allowing perceptions to be tracked throughout the project. This gave Defra an idea of whether communications were having an impact during the initiative and consequently, how successful the UKCCCI was as a whole. Given that this data was available, published approximately every six months and was collected for the UKCCCI, it was decided that this questionnaire-based study would use questions verbatim from the COI surveys. The questionnaires are shown in appendix 1. For information, the questions that were drawn verbatim from the COI surveys are those numbered one to ten in the 'Wellingborough Toolkit' survey.

The COI questions chosen for use in this study had not been subject to academic peer-review but did supply a baseline against which perceptions measured for the case studies could be compared to national perceptions. Additionally, a more academically-rigorous approach was undertaken to measure climate change worldview. Ajzen (2002) states that there are two methods of ascertaining attitudes: the direct measure which involves monitoring physiological responses to attitude questions but which is too time intensive for the size of sample used in this research; and the explicit measure which was employed here. There are two explicit measures of attitude, both of which utilise scale measurements. The direct evaluation measure involves asking an individual what they think specifically about an attitude object. The inferred evaluation measure uses multiple direct evaluations to infer an overall attitude to an object. Responses are collated from agreement or disagreement with positive and negative statements about the attitude object and averaged. Ajzen (Ibid., 111) states that there are "psychometric advantages of inferred attitude measures over direct assessment techniques".

The New Environmental Paradigm (NEP) Scale (Dunlap & Van Liere, 1978) or New Ecological Paradigm (also called the NEP) Scale (Dunlap et al, 2000) is an example of an inferred measure and has been used for many years in environmental studies as a measure of worldview in relation to the environment and the economy (e.g. Deng et al, 2006; Nooney et al, 2003; and Pierce et al,

1987). The latest version of the NEP Scale asks respondents about their agreement with fifteen statements on a five-point Likert (Likert, 1932) scale. Six statements from the NEP scale were chosen and 'converted' to tap perceptions of climate change specifically, rather than the environment in general. Table 3.5 shows the six NEP scale questions used and the reworded statements asked in the questionnaire. Respondents were asked to what extent they agreed with each of the statements with the potential options: 'strongly disagree', 'disagree', 'neither agree nor disagree', 'agree' and 'strongly agree'. The starred items were reverse coded for analysis as disagreement indicated a pro-environmental attitude. As the authors point out, "the revised NEP Scale should prove useful in tracking possible increases in endorsement of an ecological worldview, as well as in examining the effect of specific experiences and types of information in generating changes in this worldview" (Dunlap et al, 2000, 255). Therefore, in addition to the questions from the COI survey, a climate change-related scale-type question based on the statements in the NEP was included to gain a single, inferred measure of 'climate change worldview', which was compared before and after the interventions took place. 'Converted' statements were chosen based on the pilot studies (see section 3.3.7).

Original statement from New Ecological Paradigm Scale	**'Converted' statement used to ascertain attitudes towards climate change**
1. We are approaching the limit of the number of people the earth can support	1. We are approaching the point at which the Earth's Climate System cannot function
2. Humans have the right to modify the natural environment to suit their needs	2. Humans have the right to release into the atmosphere as much carbon dioxide as they wish*
3. Plants and animals have as much right as humans to exist	3. The effect of climate change on plants and animals is as important as its effect on humans
4. Humans will eventually learn enough about how nature works to be able to control it	4. Humans will eventually be able to provide technological and scientific solutions to climate change*
5. Humans are severely abusing the environment	5. Humans are seriously abusing the Earth's atmosphere
6. The so-called "ecological crisis" facing humankind has been greatly exaggerated	6. The possible consequences of climate change have been greatly exaggerated*

** items that were reverse coded for analysis*

Table 3.5: Items from the New Ecological Paradigm (NEP) scale that were used in the questionnaire having been altered to assess climate change worldview.

Given that the C-Change project aimed to impact on the perceptions of children and young people, the Children's Environmental Attitude and Knowledge Scale (CHEAKS; Leeming et al, 1995), was considered as an alternative measure of attitude to the scale derived from the NEP. CHEAKS was developed to assess the knowledge, emotions, attitudes and behaviour of children in relation to the environment and was derived from the Ecology Scale of Maloney & Ward (1973). However, having decided on a concise questionnaire (see section 3.3.3 regarding practical considerations in relation

to this methodology) to increase the number of respondents, this scale was considered too long and time-consuming. Furthermore, a scale that was consistent across all case studies was considered more suitable and, given that CHEAKS was designed specifically for use with children, it would have been more applicable to just the C-Change case study.

In summary, the study attempted to take account of the following theoretical considerations:

- to collect data that was comparable to a baseline (the bi-annual COI surveys);
- to obtain an inferred measure of climate change worldview (a scale-type question based on the NEP scale was developed); and,
- to obtain data from a sufficiently large sample to permit statistical analysis, including analysis within each case study dataset (a concise questionnaire was used to maximise response rate).

3.3.3 Practical considerations

3.3.3.1 Working in partnership with other organisations

The researcher could not simply design and implement the research because the project management committees were partners in the evaluation. The research reported here served a dual purpose, which was mutually beneficial to the researcher and the individual projects: to provide data for this thesis and to provide data for an evaluation report, which Defra required as a condition of the UKCCCI funding. Therefore, the methodologies for each separate case study had to be agreed between the two parties. The three projects had different target audiences and it was decided, for the sake of comparability, that the same questions would be asked for each case study (see above). Below, the practical requirements of the three project committees are described in relation to the data collection process. Section 3.3.7 describes how the content of the questionnaire was piloted and agreed.

3.3.3.2 'Everybody's talking about climate change' practical considerations

As noted earlier, the ET campaign a target audience of approximately two million people. The management committee for ET had not budgeted for a large and costly evaluation in their project proposal, and wished to spend a minimal amount on data collection. The chosen methodology involved surveying a representative sample before and after the campaign and took into account the evaluation budget. Two specific costs were incurred for the pre- and post-intervention surveys: purchasing the contact details of individuals who fitted the sample frame from a privately-owned credit checking company based in Nottingham; and paying for the telephone survey to be carried out by a call centre operated by Derbyshire County Council. These costs limited the total number of people that could be surveyed and it was agreed between the researcher and the ET management

committee that a total sample size of approximately 360 would be a suitable compromise between cost and quantity of data. A long survey would be more costly as it would take more time to administer, so it was also agreed that a short questionnaire would be appropriate. Additionally, the time at which the two surveys could be carried out was dictated by the workload of the call centre (for details of the methodology for the ET data collection, see section 3.3.5).

3.3.3.3 'C-Change' practical considerations

The Woodcraft Folk has a long history of carrying out environmental and peer education initiatives (Fleming et al, 2004; Fleming et al, 2007a; Fleming, 2007b), and several of these programmes were subject to evaluation in conjunction with academic institutions (Ibid; Devine-Wright et al, 2004). Several members of the C-Change project committee were involved with these previous projects and, perhaps because they had knowledge and experience of the rigour required for academic research, they opted for a methodology informed only to a small extent by academic methods. Understandably given their target audience, the steering committee wanted the evaluation to be fun to take part in and not reduce the participants' enjoyment of the events; in other words, the committee hoped the data collection would be an enjoyable part of the event in its own right. Various methods were suggested, including: printing the survey questions on large posters (A0 or B1 sized paper) and asking each respondent to place a sticker in the box that signified their answer; or using several post-boxes for each question and asking respondents to place a numbered card in the box that signified their answer. After much discussion, it was decided that these methods were impractical and that a bespoke approach would be adopted for each event (see section 3.3.5). The steering committee wanted to ensure an inclusive process, so that all levels of ability were able to answer the questions. Consequently, they desired a short questionnaire that could be completed in approximately five minutes. Furthermore, care was taken to ensure that the data collection did not detract from the communication activities.

3.3.3.4 'Wellingborough Toolkit' practical considerations

The WT project received only a small amount of funding and had no mechanism in place for evaluation before they agreed to work in partnership with the researcher. The management committee was happy to allow the researcher to design and implement the research and offered to assist wherever possible. The only practical constraints in this case were the lack of funds available for the research and the relatively small number of people who actually received communications.

3.3.3.5 Summary of practical considerations

In summary, the qualitative data collection attempted to take account of the following practical considerations:

- to use a concise questionnaire and attempt to increase response rates, in line with the wishes of all the project steering committees;
- to use questions that would appeal to, and be understood by, a range of groups, including children; and,
- to use questions that could be asked in a variety of ways (e.g. on paper questionnaires or face-to-face), due to the variety of data collection techniques desired by the different projects.

3.3.4 Data collection methodology

Survey respondents were chosen in different ways for each case study as dictated by the nature of the target audience and the desires of the management committees (see section 3.3.3). Consequently, the data collection techniques were different for each case study. Below, these varying strategies are described in detail and the demographics of the samples are provided.

Everybody's talking about climate change

Pre- and post-communication questionnaires were administered using telephone surveys. Derbyshire County Council provides an autonomous call centre that can be employed by different departments of the Council to carry out any type of telephone service (such as sales, information provision or surveying). A meeting was held in early December 2006 between the researcher, the ET project manager and the call centre manager to discuss the most appropriate course of action for the surveying. It was decided that both rounds of surveying would employ the same strategy and a sample (with details of the name, telephone number, gender and age of the potential respondents) would be obtained from Experian, a credit-checking company based in Nottingham, before and after the communication. This provided a list of thousands of potential respondents from the target audience. The people from this list were contacted sequentially (including calling individuals back if they were not available or did not answer the telephone) until at least three hundred respondents had been surveyed or a final deadline date was reached (whichever occurred second). It took approximately three weeks for each survey to be administered. The questions chosen from the COI survey were asked word-for-word by the call centre operatives to ensure comparability.

It was decided that a relatively short telephone survey would be used to maximise response rate and ensure a sufficient sample could be obtained with a relatively small amount of funding. A stratified random sampling procedure was then employed by randomly sampling the subgroups created by the independent variables (age group, gender and county of residence) using the list from Experian. The desired sample framework was to reflect the UK population and it was

requested that the call centre attempted to: produce a sample roughly divided equally between males and females; approximately 10% aged 18-24, 70% aged 25-64 and 20% aged 65 and over; and also that roughly half the sample were resident in each of the two counties where the communications were targeted. After administering the pre-intervention survey, the call centre cited several reasons why it had proved difficult to collect data from the '18-24' age group. In addition to the fact that they were by far the narrowest age range, when compared to the other target groups they were less likely to be in during working hours, they were less likely to own their own house and they seemed to have a general disinterest in completing surveys. Therefore, the desire to contact a large number of individuals in each of the '18-24' groups was relayed to the call centre to try and maximise respondents in this age range for both surveys. The actual sample frames obtained for pre- and post-campaign surveys are shown in figures 3.6 and 3.7.

Care must be taken in interpreting all the results, because both samples are skewed towards the older age groups. For both the pre- and post-communication questionnaires, there are a large number of '65 or over' respondents as a percentage of the total sample (relative to the percentage of those aged 65 and over actually living in the two counties). Additionally, in the post-communication questionnaire there is a very small number of '18-24' year old respondents.

		Actual number of respondents		
	Age range	**18-24**	**25-64**	**65 and over**
Live in Nottinghamshire	**Male**	6	22	47
	Female	4	23	35
Live in Derbyshire	**Male**	3	24	50
	Female	11	25	56

Total number of respondents = 307 (Note: if the numbers in the grid are added together they total 306, but one respondent did not supply any demographic data)

Table 3.6: Sample for the ET pre-communication survey

		Actual number of respondents		
	Age range	**18-24**	**25-64**	**65 and over**
Live in Nottinghamshire	**Male**	1	35	41
	Female	2	35	37
Live in Derbyshire	**Male**	2	50	45
	Female	4	52	43

Total number of respondents = 347

Table 3.7: Sample for the ET post-communication survey

Table 3.8 shows the number and percentage of respondents by demographic variable for the pre- and post-communication surveys.

Survey	Gender		County		Age group		
	Male	Female	Notts.	Derbys.	18-24	25-64	65+
Pre-communication survey	152 (49.7%)	154 (50.3%)	137 (44.8%)	169 (55.2%)	24 (7.8%)	94 (30.7%)	188 (61.4%)
Post-communication survey	174 (50.1%)	173 (49.9%)	151 (43.5%)	196 (56.5%)	9 (2.6%)	172 (49.6%)	166 (47.8%)

Note: Total may not equal 100% due to rounding

Table 3.8: Number and percentage of respondents by demographic variable for the ET pre- and post-communication surveys

C-Change

The questionnaire survey is presented in Appendix 1, along with all the potential response options. The Appendix presents the questionnaire in paper format and it is noted which additional questions were asked in just the post-communication survey. Given the differing nature of the six C-Change events, the administration of the questionnaire was the most difficult part of the evaluation. All data collection had to be tailored differently for each event, but had to remain comparable. The methodology adopted for each of the five C-Change events at which quantitative data were collected is described below (note that questionnaires were not collected at the Film Festival).

As it was not known who would be attending most of the events beforehand, pre-communication data were collected via a paper questionnaire at the beginning of all the events. The individuals who attended were also spread geographically and they would not gather again in a single place. Therefore, the questionnaire asked all respondents for their email address and a bank of names was created and sent a request to complete a post-communication questionnaire after at least one month had elapsed following the event. This email request included a link to an online questionnaire hosted on the De Montfort University (DMU) server (www.iesd.dmu.ac.uk/survey/c-change) and all post-communication surveys were collected online. As an incentive designed to increase response rate, all respondents to the post-communication survey were offered the chance to win one of two Apple iPods, with the draw taking place in early April 2008. Two follow-up emails reminding all respondents to fill in the questionnaire were sent approximately three weeks apart as a further tactic to increase response rate.

The final event (C-Cast conference) took place in late January 2008 and the time constraints for C-Change to report to Defra meant that post-intervention data had to be collected as soon as possible

after that date. It was decided to leave it at least one month before collecting the post-communication questionnaires for this final event, to ensure a sufficient amount of time had passed to make the evaluation meaningful (i.e. so that any differences pre- and post-communication could be identified). This also meant that the maximum amount of time was available to collect all the post-communication responses from the other events.

'Face your elephant' tent

The 'Face your elephant' (FYE) tent went to several summer festivals between May and September 2007: Glastonbury music festival; HUB Urban Youth festival; Scout Jamboree; and Thames Festival. Given that the same communications were carried out at each event, all the questionnaires collected from the different FYE events were analysed together. Questionnaires were given to people on their entry to the tent and they were offered the incentive of either a temporary 'C-Change tattoo' or a fruit smoothie (which was created using pedal power) if they handed a completed form to a member of C-Change staff. Post-communication surveys were collected via the online questionnaire. All potential respondents were sent an initial email request on 8 January 2008, a follow-up on 7 February 2008 and a final reminder on 2 April 2008.

Party for the Planet and Battle of the Bands

Both these events took place on and around the bandstand at Clapham Common on 7 July 2007. As it was a relatively large event in a public park, there was no official 'entrance' and people were able to wander up to the activities and to listen to the bands playing throughout the day. There was also no discernible time at which one of the activities ended and the other began. Therefore, it was not feasible to separate these two events into two different 'communications' and they have been evaluated together, as a single event. Given that this event involved a high demand on C-Change staff time, it was decided to use two additional researchers from DMU to collect the data, allowing C-Change staff to concentrate solely on co-ordinating and delivering the activities. The researchers used clipboards and went around the event asking attendees to fill in a questionnaire, which was completed face-to-face with the researcher writing down respondents' answers. Once again, a temporary tattoo was offered as an incentive. Post-communication surveys were collected via the online questionnaire with emails being sent to all potential respondents on 8 January 2008, 7 February 2008 and 2 April 2008.

Club nights

The four club nights took place in four cities around England in January 2008: Brighton; London; Leeds; and Manchester. As there was a staffed entrance due to the age restrictions in night clubs, it was relatively easy to collect questionnaires before the communication took place. Respondents

were asked to fill in a questionnaire at the door or whilst queuing up to enter the night club. As the communications at each club night were the same, they were analysed as a single form of communication. Potential respondents for the post-survey were emailed initially on 28 February 2008, followed by a reminder email on 6 March 2008 and a final email reminder on 2 April 2008.

C-Cast

The C-Cast event comprised two different forms of communication: a conference attended by 6th form school children and teachers held at City Hall in London; and a 12-hour radio broadcast transmitted over community radio stations and the internet. An online questionnaire was created so that individuals listening to the radio programme over the internet could fill in a pre-communication survey. Unfortunately, no-one filled in the questionnaire meaning that there were no survey data relating to this aspect of C-Cast. However, the radio broadcast is the subject of another evaluation report (Lace, 2008). The attendees at the conference were known before the event occurred as it was organised directly with teachers from local schools. Pre-communication questionnaires were sent to the teachers and the pupils filled them in before the conference and handed them to C-Change staff on arrival at City Hall. The post-communication questionnaire was advertised through the teachers as the researcher was not allowed access to the pupils' contact details. The teachers were sent an initial email on 28 February 2008 requesting them to ask their pupils to fill in the online questionnaire. Follow-up emails were sent on 6 March and 2 April 2008.

.

The methodology for collecting pre- and post-communication data presented was relatively easy to define, given the constraints presented by the nature of the communications events. Firstly, the individuals who took part in the communications were unknown before the events took place (with the exception of the C-Cast conference, see above) and could therefore only be contacted just before or during the event. In order to make the survey 'pre-communication' in a strict sense, it was attempted to survey people before they actually took part in any activities. Secondly, it was known that contact could be made with potential respondents for the post-survey via the bank of email addresses that were collected from the pre-surveys. Therefore it was very important to collect as many questionnaires (and email addresses) as possible. As such, the sampling strategy for all the C-Change events can be described as an example of 'convenience' sampling (Robson, 2000).

Table 3.9 shows the number of people surveyed for each of the four communication events described above. The columns in the table report several things for each separate event: the number of pre-communication questionnaires that were collected; the number of email addresses that were filled in on the questionnaires; the number of email addresses that were legitimate (i.e. how many emails reached the intended recipient and did not 'bounce back' when sent an email

requesting the owner to complete the online follow-up survey); and the total number of respondents to the post-communication survey. Table 3.10 shows the same information for each of the separate 'Face your elephant' tent events.

Event	Number of pre-communication responses	Number of email addresses on pre-communication questionnaires	Number of potential respondents for post-communication survey	Number of actual post-communication responses
'Face your elephant' tent	674	473	303	124
Party for the Planet and Battle of the Bands	103	69	49	17
Club Nights	102	86	52	15
C-Cast Conference	36	N/A	60*	7
Total	915	688	464	163

**This is the total number of pupils who attended the conference. Assuming that the teachers could contact all their pupils, this represents the total number of potential respondents for the post-conference survey.*

Table 3.9: Samples for C-Change pre- and post-communication surveys by communication type.

'FYE' Event	Number of pre-communication responses	Number of email addresses on pre-communication questionnaires	Number of potential respondents for post-communication survey	Number of actual post-communication responses
Glastonbury music festival	136	116	90	33
HUB Urban youth festival	109	55	30	10
Scout Jamboree	211	161	97	44
Thames Festival	218	141	86	37
Total	674	473	303	124

Table 3.10: Samples for 'FYE' tent pre- and post-communication surveys by event attended.

Wellingborough Toolkit

The Wellingborough Toolkit aimed to reach the individuals who took part in toolkit-related activities. Therefore the target audience were the people who actually experienced the intervention and included Borough Council of Wellingborough (BCW) staff and members of community groups who saw the presentation. Both pre- and post-questionnaires were collected from BCW employees by means of an email to all staff. It was also relatively easy to obtain pre-communication questionnaires from community group members, as it was possible for BCW staff to survey people whilst they were at the presentation. However, it was quite difficult to obtain the post-communication questionnaires from community groups as BCW staff did not return to the groups. Therefore, for the post-questionnaire from this latter section of the target audience, data were collected from all those who had put contact details on their initial questionnaire. This involved both electronic contact via email and also telephone surveys by the researcher. Even though this methodology was different to the pre-communication questionnaire, it was considered much more worthwhile than having no follow-up sample from community group respondents.

The COI surveys (mentioned above) that collect data from a representative sample of the UK also collect data on a number of independent socio-demographic variables. Three independent variables were chosen: two from the list of independent variables collected by the COI; and one specific to this project. As the Wellingborough Toolkit had two specific target audiences, BCW staff and members of local community groups, it was decided to record which of these two groups the survey respondent belonged to. In addition, the gender and age of the respondent was included in the survey. Tables 3.11 and 3.12 show the socio-demographic profile from the two rounds of surveying. The sample is skewed from the youngest age group, which may suggest that care should be taken when considering these results. However, the socio-demographic profile of the target audience itself was unknown (as the toolkit aimed to impact on whoever attended the presentations), and the sample reflects this inevitable 'unknown' in the target audience. Table 3.13 shows the number and percentage of respondents by demographic variable for the pre- and post-communication surveys.

		Number of respondents		
	Age range	**18-24**	**25-64**	**65 and over**
BCW Staff	**Male**	0	17	0
	Female	3	38	0
Community group members	**Male**	0	8	7
	Female	0	2	2

Total number of respondents = 87 (Note: if all the numbers in the table are added together it totals 77, but 10 respondents did not supply all the demographic data)

Table 3.11: Sample for the WT pre-communication survey

	Age range	Number of respondents		
		18-24	25-64	65 and over
BCW Staff	Male	0	12	0
	Female	3	17	0
Community group members	Male	0	5	4
	Female	0	0	2

Total number of respondents = 47 (Note: if all the numbers in the table are added together it totals 43, but 4 respondents did not supply all the demographic data)

Table 3.12: Sample for the WT post-communication survey

Survey	Gender		BCW staff or community group member		Age group		
	Male	Female	BCW Staff	Comm. Group	18-24	25-64	65 and over
Pre-communication survey	32 (41.6%)	45 (58.4%)	58 (75.3%)	19 (24.7%)	3 (3.9%)	65 (84.4%)	9 (11.7%)
Post-communication survey	21 (48.8%)	22 (51.2%)	32 (74.4%)	11 (25.6%)	3 (7.0%)	34 (79.1%)	6 (14.0%)

Note: Total may not equal 100% due to rounding

Table 3.13: Number and percentage of respondents by demographic variable for the WT pre- and post-communication surveys

3.3.5 Data analysis methodology

Survey responses were collated in an SPSS (Statistical Package for the Social Sciences) spreadsheet. The method used to populate the SPSS spreadsheet varied depending on the case study and the method that had been used to obtain the data.

- For the 'C-Change' project, pre-communication questionnaires were collected on paper at the start of the events, so responses were entered manually. The post-communication survey involved emailing all the respondents to the first survey who had supplied an email address. An online survey was created and hosted on the De Montfort University website (using HTML and PHP) and the data submitted by respondents automatically populated an Excel spreadsheet. These data were copied and pasted into an SPSS file for analysis.
- For the 'Everybody's talking about climate change' campaign, data were collected by the call centre at Derbyshire County Council and supplied to the researcher in an Excel spreadsheet. These data were copied and pasted into an SPSS file for analysis.

- For the 'Wellingborough Toolkit' project pre-intervention survey, paper questionnaires were administered before the presentations were given to council staff or local community groups. The follow-up survey of council staff was conducted by sending a global email to all council staff asking whether they had engaged with the toolkit and, if so, to fill in a paper questionnaire (attached to the email). Community group members were contacted post-intervention by telephone or email, depending on which method of contact they had supplied on the initial questionnaire. All data were entered manually into an SPSS spreadsheet.

The actual data analysis methods used are reported in chapters 4 and 5 under each of the five specific research questions identified in table 3.1. However, the general process of analysis involved both exploratory and confirmatory data analysis. The data were explored using descriptive statistics and more powerful and complex statistical techniques were researched and chosen based on their ability to answer each research question.

3.3.6 Questionnaire pilot study

Given that most of the questions were taken from the COI survey, it was not possible to change them after piloting if the two datasets were to be directly compared. Additionally, piloting of these questions was not entirely necessary as individuals with similar characteristics to the research sample had been asked the questions in the previous COI surveys. However, the scale question, even though based on the NEP scale which has been used in many different contexts over the past 30 years needed to be piloted to ensure that the 'converted' statements were understood by members of the different target audiences, including the young people targeted by C-Change. It was decided that it was worthwhile piloting the whole questionnaire, including the COI questions, so that the scale could be tested and the final structure and ordering of the questions could be determined. Consequently, a small pilot survey was implemented for each of the three case studies:

- First of all, members of the youth steering committee for C-Change were chosen to reflect the young people they were attempting to engage. The first pilot study was conducted with these 20 people at their first steering committee meeting approximately two months after funding was allocated. The researcher sat with the group as they completed the survey and asked them to mention any things they had trouble understanding. Several issues were highlighted, including the length of the questionnaire and the choice of statements making up the scale. Different NEP scale items were chosen (in conjunction with the

committee members) and the questionnaire was shortened to fit onto two sides of A4 paper.

- Secondly, the Borough Council of Wellingborough regularly surveys members of their community and, for this purpose, they have a representative group that they can draw on called the Citizen's Panel. Postal questionnaires were sent to 50 panel members for the second pilot study (24 were returned). Respondents were told that the survey results would not be analysed and asked to comment on any difficulties they had with the questions. All 24 surveys were returned complete and no problems were highlighted.
- Derbyshire County Council also has a panel of residents that it surveys regularly, twelve of whom were surveyed over the telephone for the third pilot study (one individual was surveyed for each section of the sample frame shown in table 3.3). This was to ensure that this different data collection technique did not pose any further difficulties, which were not identified in the other pilot and, once again, respondents were informed of the reasons for the study. No problems were identified.

4. Perceptions of climate change

Chapter 4 of the thesis addresses the first broad research aim identified in table 3.1: to understand people's perceptions of climate change. Section 4.1 draws on the qualitative 3CM data to answer research question 1: how do individuals conceptualise climate change? Section 4.2 analyses part of the quantitative survey data to answer research question 2: do perceptions of climate change differ from the national to the more local level? Specifically, the latter section compares national data on climate change perceptions collected by COI (2006) to regional data collected for this thesis.

4.1 How do individuals conceptualise climate change?

4.1.1 Introduction

The method used to collect the 3CM data was described in chapter 3 and the analysis methodology is described below, in section 4.1.2. The recruitment of participants is described in section 3.2.5.4; data were collected only from the Wellingborough Toolkit and Everybody's talking about climate change case studies; for the reasons discussed in section 3.2.3, C-Change did not want the people they had engaged with to be interviewed. Irvine's (1997) approach to data analysis was followed, which involved content analysis of both category labels and individual concepts to identify common themes amongst the participants; no 'a priori' themes were imposed on the data. Therefore both *content*, the individual concepts that individuals consider important about climate change, and *structure*, the manner in which the individual related these concepts, were generated. Whole cognitive maps were compared and the overarching objectives of the analysis were to identify and compare individual knowledge structures and to produce a list of representative or shared concepts that captured the range of perceptions shared by the participants.

Interim results from this quantitative study were presented at the International Association of People-Environment (IAPS) Conference (White, 2008); the presentation is included in appendix 4.

4.1.2 Analysis methodology

The analysis methodology was largely based on Kearney & Kaplan (1997) and drew further from the content analysis performed in Irvine's (1997) 3CM study[2] (see below for a description of these studies). A series of 20 worksheets on Microsoft's Excel Spreadsheet package were used to present each participant's 3CM. Subsequent iterations of the analysis were tracked on further worksheets, ensuring that all data was contained in a single 'master' document. To ensure that the

[2] Irvine was a member of the SESAME group at the University of Michigan, which developed the 3CM data collection and analysis methodology. Studies by members of SESAME include Austin (1994) and Kearney & Kaplan (1997).

categorisation was reliable, the whole process of analysis was iteratively discussed with two other researchers (Brown et al, 2007). This involved close scrutiny of both the decision rules chosen for the analysis (described in chapter 3) and the resulting categorisations. Researchers liaised at several points during the analysis period focussing on different aspects of the process: an initial meeting discussed the decision rules; a second meeting considered the placing of categories into major themes; and several final meetings involved a thorough review of the whole analysis and the identification of representative concepts. This latter task required several iterations before all three researchers agreed upon the representative concept list.

First of all, participant-generated categories were combined into major themes based on the category label given by the participant and the concepts they placed in each category. A number of decision rules were used for this process. If the category label was incoherent or if the concepts placed into a category by the participant suggested more than one of the emerging major themes, the major theme most prevalent was chosen. If two themes had equal prevalence in the category, the category label was reviewed to see which major theme was most applicable. If it was not possible to choose a major theme using the category label and contents, the category was placed into a theme entitled 'other'. In addition to the 'other' theme, six major themes were identified at this point ('Impacts', 'Mitigation', 'Information sources', 'Causes', 'Responsibility' and 'Views and feelings') and these are described in section 4.1.3.1.

Presented below is an example of how the decision rules worked for the initial identification of major themes. Interviewee 11 labelled a category 'Disease/risks for the future' and placed the following three concepts into the category: 'increased temperatures'; 'health risks'; and 'worry about future generations'. Both the category label and the first two concepts suggested that the category should be placed in a theme about the impacts of climate change, but the latter concept related more to the feelings of the participant. Based on the fact that the 'impacts' theme was both referred to in the category label and more prevalent in terms of the number of concepts, the category was assigned to the 'impacts' theme.

Once all categories had been analysed in this manner, the individual concepts were reviewed and those that did not fit the major theme into which they had initially been placed were moved to the appropriate theme. It is important to point out that this was an iterative process. Major themes were refined and redefined as the data at concept level were analysed. During this stage of the analysis, all concepts in categories placed in the 'other' group were moved to one of the other emerging six major themes. A total of 12 concepts were removed from the analysis at this point as they did not relate to any of the emerging major themes. Therefore, at the conceptual level, all

individual concepts were placed under one of six major themes, which are highlighted and explained in section 4.1.4.

The next step of the research involved analysis at the conceptual level, to identify a number of representative concepts that were shared across participants. Identification of this list was also an iterative process. Initially, all 557 individual concepts were printed on cards and grouped with concepts of similar meaning and/or subject. Again, a number of decision rules governed this process.

- **Similar meaning or subject** - Concepts that highlighted the same issue or symbolised the same type of feeling were combined. Some of the concepts were relatively simple and, for instance, simply mentioned an objective issue relating to climate change, such as 'weather', whereas other concepts had much more detail and included both a specific issue and a qualified statement of the individual's opinion, such as 'the weather is not normal'. In some instances the interview transcripts were reviewed to assess whether context could be applied to an unqualified concept. In the example above, both concepts were categorised beneath a representative concept called 'Changes in weather patterns' as the interviewee discussed weather changes but did not capture this directly in their 3CM. Other concepts including 'seasons out of kilter' and 'impact on weather systems' were categorised under the same representative concept.
- **Level of abstraction** - Concepts that appeared to give a specific example of a wider issue were placed under a representative concept referring to the wider issue. For example, amongst other items, 'bird/insect/flower species changing patterns', 'effect on wildlife and plants' and 'nature is confused' were all categorised beneath the representative concept 'Effects on nature'.

During this stage of the analysis, several concepts were removed. As highlighted in chapter 3, two criteria were used for this removal: if the concept did not appear to be directly related to how the individual conceptualises climate change (such as "positive about other environmental issues"); and if the theme behind the concept was only elicited by a single interviewee (for example, only one interviewee mentioned that "climate change is spoon-fed to people" or that "climate change is worse than terrorism"). A total of 47 concepts were removed from the analysis at this stage. In addition to the 12 concepts removed previously (see above), this left 498 concepts for categorisation. The sheer amount of information captured in the 557 individual concepts, the varying levels of abstraction and the fact that many concepts included both a subject and a qualified description meant that the analysis was time-consuming and difficult. Several iterations were necessary to generate agreement between researchers. 53 representative concepts were finally produced with between two and twenty-three individual concepts categorised beneath them.

Once the representative concepts had been identified, a short pilot study using the structured 3CM process (Kearney & Kaplan, 1997) was used to ensure the list was applicable and could be used without editing as a tool in future 3CM studies. This study involved a number of researchers at De Montfort University, several of whom had considerable experience in social research. In addition to taking part in the task, colleagues were asked for their opinion on the process and content of the structured 3CM. This section of the research therefore served a dual purpose: to trial the list of representative concepts in a pilot 3CM study; and to further demonstrate that the results produced from the analysis were sound. Results of this section of the analysis are presented in section 4.1.3.5.

4.1.3 Results

4.1.3.1 Interviews - descriptive statistics

The total number of concepts generated across the twenty interviews was 557. The mean number of concepts generated per interview was 28 and there was a range between 21 and 37. There were a total of 93 categories created across the 20 participants and the mean number of categories was 4.65 per interviewee, with a range between 3 and 6. This is in line with the expectations of Mandler (1975) who states that people tend to think about issues in terms of five plus or minus two categories - between 3 and 7 - due to limited channel capacity. This shows that the study met one of the measures of construct validity noted by Kearney & Kaplan (1997) with respect to the relationships between concepts. The number of concepts placed into individual categories varied between 1 and 12, with a mean of 6.

Interviews lasted an average of 45 minutes, with the longest taking 70 minutes and the shortest taking 30 minutes. Observationally, the length of interview seemed to vary with how comfortable the interviewee appeared to be in talking about climate change. Eight out of the twenty interviewees decided to add concepts from the list generated during exploratory study (see section 3.2.2.2 for a list of the concepts), which was offered to them after categories had been created. Seven interviewees added a single concept and one interviewee added two further concepts at this stage. In no cases did the addition of concepts from the pilot study list generate new categories, concepts were added to existing categories: ‘media hype‘ was added by three interviewees; ‘flooding‘ and ’carbon emissions’ were added by two interviewees; and ‘contradictory evidence‘ and ‘research‘ were added by one interviewee. Even though few concepts were added directly from this list, the viewing of further examples did, in several cases, prompt interviewees to add more of their own concepts to existing categories. This suggests that the methodology did elicit interviewees’ cognitive structures, as interviewees appeared to only place concepts that they ‘owned‘ (Kearney &

Kaplan, 1997) in their maps. All of these added concepts, whether they were added directly from the list or generated by the interviewees after having sight of the list, were included in the analysis. Further evidence of the method's applicability is evidenced by questions asked post-interview (results of all post-interview questions can be seen in table 4.1). Participants were asked if the task clarified their own understanding of climate change on a 5-point scale. The mean response was 3.2. Participants were also asked how well the task expressed their thoughts about climate change and the mean response was 4.5.

Question*	No. of interviewees responding	Mean	Range	Standard deviation
How well did this task express your thoughts about climate change?	20	4.5	3-5	0.761
Did this task clarify your own understanding of climate change?	20	3.2	1-5	1.105
Did you enjoy the card-sorting task?	20	3.95	3-5	0.759

**the following scale was used for each question: 1 = not at all; 3 = somewhat; 5 = very much*

Table 4.1: Descriptive statistics for the post-interview questions

Socio-demographic data were collected from each of the interviewees. The average age of the interviewees was 45 years, with a range between 27 and 71 years and there was almost an even spread in terms of gender, with eleven females and nine males taking part. To put into context how much interviewees knew about the environmental agenda in general, they were asked if they were members of any environmental groups and six out of the twenty respondents stated that they were (examples of such groups as quoted by interviewees include the Soil Association, World Wildlife Fund or the Royal Society for the Protection of Birds). None of the interviewees stated that they had seen any of the other projects funded by Defra's UK Climate Change Communications Initiative (UKCCCI).

4.1.3.2 Map structure

The six major themes identified from the categories created by the 20 interviewees are highlighted below along with an explanation of the theme and examples of both category labels and concepts placed under each theme. Table 4.2 lists the major themes into which all the category labels were placed and shows that participants thought about climate change in very different ways. Some

people tended to think about climate change in terms of a small number of issues whereas other people talked about climate change across a wider range of themes. For example, participant 6 produced five categories in his 3CM which were assigned between just two major themes, while on the other hand, participant 9 created six categories which were each assigned to a different major theme.

	Participant																			
Theme	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Impacts	* *	* *	*	*	*		*	* *	*	* *	* *	*	*	*		*	*	*	*	*
Mitigation	* *		*	*	* *	* *	*	*	*	*	* *	*	*	*	*	*	* *	* *		*
Information sources	*	*		*			*		*			*	*	*	*	* *			*	
Causes			*						*							*				*
Responsibility			*	*	*		*	*	*		*	*		*	*	*	*		*	*
Views & feelings		* *	*	*		* * *		*	*						*			*	*	
Other				*									*				*			
Total number of categories	5	5	5	6	4	5	4	6	6	3	5	4	4	4	4	6	5	4	4	4

Table 4.2: Major themes and the number of categories assigned to each theme per participant

Impacts - This theme includes all instances where participants stated that climate change will have an impact on the world and examples of the type of impact it may have or is already having. Most of the categories were about the fact that climate change would have 'an impact' in a general sense and included concrete examples of a diverse range of what impacts may occur. For example, the category created by participant 1 called 'Effects/consequences of global warming' included the concepts 'effects of climate change on nature', 'getting hotter' and 'sea levels rising'. Other categories were even more specific and mentioned a range of impacts that climate change might

have on a particular issue, such as the category 'Positive impact on the garden' which included concepts such as 'milder winters', 'reduce wastage of water' and 'can now grow tropical plants in garden'. Furthermore, some categories included both typical, theoretical impacts of climate change that one might read about in the media along with personal anecdotes about how climate change has impacted on people's daily lives. For instance, participant 9 labelled a category 'Consequences of climate change' which grouped together the concepts 'bird/insect/flower species changing patterns' and 'floods' with 'I've noticed extreme weather' and 'vegetable growing went wrong'.

Overall there was a huge range of potential impacts grouped under this major theme and the general view of the participants was that climate change was something that was happening and the consequences were something that we should fear, but also try and prevent. The fact that participants listed impacts of climate change, certainly amongst those who were not outwardly sceptical, can be seen as evidence that they believed the phenomenon is occurring. As can be seen from table 4.2, nearly all participants (18 out of 20) included at least one 'impacts' category and there were a total of 24 such categories across all participants. Participant 6 did not include an 'impacts' category in their 3CM because they were sceptical that the phenomenon was actually occurring. Additionally, participant 2 included two 'impacts' categories even though they were also sceptical. Furthermore, despite the fact that participant 15 did not have a specific 'impacts' category, they did include a number of individual concepts about impacts of climate change in their other categories.

Mitigation - This theme incorporated all categories that related to mitigating climate change. Included here were a range of different tools that could reduce human's impact on the global climate, from small, individual behaviours up to large, technological solutions. Some categories included a broad range of actions at various levels, grouped under a category label about general climate change mitigation. For instance, the category 'Actions' included the concepts 'government needs to take the lead', 'education/awareness important', 'tighter legislation could help', 'reduce car use/increase public transport' and 'saving energy'. Other categories were more specific and mentioned actions solely taken at an individual level, such as the category 'Personal efforts', which contained the concepts 'recycling - easy to do', 'small actions are important to me', 'hard to have a massive impact' and 'important to be a member of environmental groups'. Some categories were more specific still and grouped a number of concepts relating to a single mitigation behaviour. This is reflected by the cognitive map of participant 3, which grouped the concepts 'composting', 'national co-ordination of recycling could help with climate change', 'easy to recycle' and 'recycling' under the category label 'Recycling'.

There appears to be a large amount of knowledge of mitigation behaviours across participants. An interesting example was presented in the cognitive map of participant 6, who, even though he was sceptical about climate change, included two mitigation categories. These categories reflected this scepticism - for instance, after reviewing the interview transcript it was evident that the category 'Positive about recycling' was created in the context that they *were not* positive about climate change - but showed that participant 6 was still aware of behaviours that according to general consensus (IPCC, 2006) would help to mitigate the problem, even if he did not believe that these actions had any effect. A further example of the awareness of participant 6 is presented by the fact that he tends to 'leave things on standby', which he knows is something that a lot of people accept as a factor contributing to climate change. Eighteen out of the 20 participants included at least one 'mitigation' category and there were a total of 24 'mitigation' categories across the 20 interviews. Of the two participants who did not include such a category, participant 2 was sceptical about climate change and mentioned no examples of mitigation behaviours during interview, whereas participant 19 included some examples within other categories such as 'reduce energy use' and 'recycling'. This broad knowledge of actions across participants - including sceptics - suggests that actions to mitigate climate change are one of the main frames through which people express their knowledge of the subject. The sheer range of actions mentioned during the interviews, from 'buy local produce', 'cavity wall insulation' and 'holidays at home' to 'building regs should be more stringent for renewables', 'people can lean on governments/multinationals' and 'tighter legislation could help', highlights the fact that there is an awareness of a broad range of behaviours and the vast majority of individuals do not require further education on this matter. This has an obvious implication for future interventions, suggesting that strategies should not be designed to raise awareness of mitigation behaviours, as the general population already know and understand a huge array of actions.

Information sources - This theme was largely about the channels and avenues through which participants received climate change information, and included examples of the type and range of information they received (including opinions about the quality of information from different sources), along with how often they engaged with climate change information. Some categories were solely about information channels, such as the category 'Science, research and media', which included the concepts 'watch documentaries', 'hear about climate change at work' and 'research'. Other categories included concepts referring to the range of information-related subjects noted above. For example, participant 16 placed the concepts 'come into contact with information weekly', 'friends' opinions are positive towards the environment', 'environmental publications (peer reviewed)', 'talk about climate change with friends/family' and 'media sources - could be sensationalised' in a category called 'Exposure'. The 'information sources' theme also included

sceptical opinions and examples of misunderstandings about climate change. For instance, participant 2 was sceptical about climate change and created a category called 'Scientific', which included the concepts 'hole in the ozone layer', 'scientists could have more information', 'scientists need to find and tell more to public' and 'no-one's certain about how [climate change] works'. There were two further participants who included concepts relating to the ozone layer, showing that confusion about this issue and climate change was evident amongst the research group, although in a relatively small number of interviewees.

Twelve categories were placed into the 'information sources' major theme, with ten interviewees including one category and one including two categories. However, 'information sources' was the major theme into which most concepts were transferred after the initial stage of the analysis (see section 4.1.2), so there were a greater number of individual concepts referring to 'information sources' than the number of categories suggests. The reason for this may be that 'information sources' is not as coherent or ordered a category as 'mitigation' or 'impacts' in the knowledge structures of the participants.

It is also very interesting to note that only one concept generated throughout the entire study - '[The Wellingborough] toolkit was the only major education device' - referred specifically to the UKCCCI intervention that the participant had taken part in. This does not necessarily mean that the interventions did not have any impact as the other concepts about climate change in general may reflect the contents of the intervention. However, it does clearly show that the interventions themselves were not one of the first thoughts respondents had about climate change and suggests that their climate change knowledge is obtained from a wider range of sources.

Causes - This major theme includes categories about the causes of climate change. The overlap between this theme and the mitigation theme has been taken into consideration in terms of the fact that the opposite of those actions that mitigate climate change are themselves causes of climate change. For example, the concept 'pollution causes climate change' created by participant 20, which was placed into the 'causes' major theme could be associated with a 'mitigation' concept such as 'reduce pollution'. However, this theme was considered different by reference to the interview transcripts: in the 'causes' categories, there was direct reference to the fact that climate change was being caused, as opposed to direct reference to actions that could mitigate it. For instance, participant 20 included a category called 'Causes', which included the concepts 'causes of climate change', 'industry impacts on climate change' and 'pollution causes climate change'. The concepts included in the 'causes' categories were either direct or indirect causes of climate change. Some concepts, such as 'greenhouse effect', 'too many CO_2 emissions' and 'carbon emissions'

were about direct causes. Other concepts were about wider issues that were responsible for causing climate change: examples include 'development is rapid', 'population growth', 'industry impacts on climate change' and 'consumer culture'. In the instances where participants mentioned these latter causes, an appreciation of the wider societal issues that contribute to climate change was evident.

Four out of the 20 participants included a single 'causes' category, showing that this theme is not highly prevalent across the sample. Apart from 'other', this was the major theme to which the least number of categories was assigned. As mentioned above, the fact that respondents were aware of individual mitigation behaviours suggests that they may be aware of some causes of climate change. For example, awareness that profligate energy use is responsible for changing our climate is inherent in the concept 'reduce energy use'. However, the broader societal causes of climate change are barely represented in the cognitive maps produced during the present research.

Responsibility - This theme was about who is responsible for causing and mitigating climate change. All the concepts in this category referred directly to a person or a group of people and ranged from individuals (i.e. 'individuals are responsible'; 'individual actions add up') to countries (i.e. 'national governments are responsible'; 'America needs to do more') to everyone (i.e. 'action from everyone is needed'; 'everyone needs to do their bit to have an impact'; 'international co-operation'). In addition to naming who was responsible, some of the concepts also referred to whether the participant believed those named actually do or will take action, such as 'governments don't take it seriously enough' and 'happy that my actions are contributing'. A good example of the range of views included in a single category was given by participant 16, who created the category 'Theory behind tackling climate change', which included the concepts 'developed countries need to lead the way', 'happy that my actions are contributing', 'individual actions add up', 'government have a large role', 'international collaboration' and 'everybody's responsibility'.

Fourteen out of 20 participants included a 'responsibility' category in their cognitive maps, showing that the assignment of responsibility for causing and mitigating climate change is an important issue for most people. The range of individuals or groups assigned responsibility was relatively coherent across participants and was not mutually exclusive and more than one group was often assigned responsibility by a single interviewee: fourteen participants mentioned the government; twelve people mentioned individuals or everybody; twelve people thought international co-operation was important; and five people cited companies. Several participants thought that government should be doing more than they are currently and that government have a responsibility to both act themselves and to encourage others to act. The fact that twelve interviewees assigned

responsibility to individuals or everyone highlights an awareness of the range of scales at which climate change mitigation activities operate.

Views and feelings - This theme covered a very wide range of views or feelings that the participants had in relation to climate change. In some cases these concepts and categories encompassed individuals' views about the entire phenomenon of climate change and examples were both positive and negative. For example the category 'Personal', created by participant 3, included both positive and negative views on the matter such as 'personal contribution can only be low', 'don't worry much about climate change' and 'belief that climate change is happening'. By its very nature, this major theme was broad-ranging and difficult to distill into a small number of observations. Category labels were, in some cases quite generic, such as 'My views' or 'Feelings' and included lots of different examples of how people thought or felt about climate change. For example, participant 4 created the category 'Personal feelings', which included the concepts 'depression', 'pessimism', 'interested', 'belief that climate change is occurring', 'children's future' and 'strong feelings'. In other instances, categories were specifically about an aspect of climate change, such as that created by one of the climate change sceptics, which was labelled 'Man's involvement'. This included the concepts 'climate change has been discovered too late to make an impact', 'human action can't really help climate change' and 'I question human's role in climate change'.

Nine out of 20 participants included a 'Views and feelings' category and there was a total of 12 categories placed under this major theme. It is interesting to note that the two sceptical participants had two and three 'Views and feelings' categories respectively, suggesting that they largely think about climate change in terms of their scepticism. Their view that climate change is not a human-caused phenomenon tends to be expressed in many of the individual concepts produced during the cognitive mapping task, which is reflected by the percentage of their categories placed under this major theme. The three 'views and feelings' categories included by participant 6 all included concepts that highlighted their sceptical opinion, such as: 'climate change has been hijacked for other motives' in the category 'Government'; 'natural disasters are worse problems [than climate change]' in the category 'Cautious approach'; and a category that was actually labelled 'One of the real problems' (and therefore implying that climate change was not a 'real' problem). In terms of non-sceptical participants' overall feelings about the phenomenon of climate change, people were largely negative. If interviewees did mention their feelings, they tended to use negative words and phrases which suggested they believed the phenomenon was frightening and that they did not believe appropriate action would be taken. This is exemplified by one of the categories created by participant 8 which evokes all the feelings mentioned in the category label which was called

'Fear/worry/hopelessness' and included the concepts 'too late to change - human nature', 'world is a terrible place', 'furious at other people' and 'worry.'

Other - The 'Other' category was used mainly for those categories that could not be placed into a major theme based on the decision rules highlighted above. The individual concepts were all transferred to one of the other six major themes during the next part of the analysis, which identified representative concepts. It was therefore evident that there was useful data collated in the 'other' theme but the labels and contents of the participants' categories meant that they were unable to be categorised during this first step.

Major theme	Category labels assigned to theme*
Impacts	Raising awareness - information from presentation; Effects/ consequences of global warming; Health and warmth; Unusual happenings; Evolution; Impact on ecosystem/weather systems; Science; International issues; Impact; Effects on the whole planet - human and non-human life; Consequences of climate change; Climate change will change the world; Positive impact on the garden; Disease/risks for the future; Housing/planning for the future and concern for wildlife; Problems and solutions; Information; The issues; Effects; Potential impacts and evidence; Natural phenomenon; The weather; Impact; and Effects.
Mitigation	Things we can do; Effects of…; Recycling; Personal efforts; Personal action; Interface; Positive about recycling; What individuals can do; Individual responsibility; Some remedies to reduce carbon footprint; To make us more aware of how we use fossil fuels; Encourage recycling and energy options; Carbon emission reduction; Personal thoughts on the problem; My contribution; Our actions; Actions; Examples of how to mitigate the effects; Costs of taking action for individuals; Individual lifestyle actions; Money-related; and Actions.
Information sources	Education; Scientific; Transfer of knowledge; The unknown; Science, research and media; Pressure; My interests; Exposure; My background; and Stopping the impact - other.
Causes	Other; Greenhouse effect and its effect on the world; Cause; and Causes.
Responsibility	International responsibility; Government/big business inaction; Leadership; Whose responsibility it is; The worldview; All people should come together to fight climate change; Everybody take responsibility/encourage action; Thoughts of other people (doom); Lack of government action; Bodies; Theory behind tackling climate change; Global perspective; Stopping the impact - government; and Views.
Views and feelings	Not telling all; Additives; Personal; Personal feelings; Government; Cautious approach; One of the real problems; My views; Fear/worry/hopelessness; Other; Feelings; Man's involvement; and Stopping the impact - individual actions.

Other	Ad-hoc; "?" ; Excuses; Perceptions; It's not one-size-fits-all; and Authority-related (i.e. Government, EU, Local Authority).

**Category label names were participant driven*

Table 4.3: Category labels and the major themes to which they were assigned

4.1.3.3 Overall view of cognitive maps

In addition to categorising the content of the individual cognitive maps and identifying salient issues based on the results, it is also important to look at each single cognitive map as a whole. As noted above, there was a wide range of knowledge about lots of different aspects of climate change across participants, particularly with reference to potential impacts and mitigation behaviours. The interviewees generally discussed the issues in non-scientific terms and related actions they could undertake to their everyday lives. For example, as can be seen in the category 'Some remedies to reduce carbon footprint' from the cognitive map of participant 9 (see figure 4.2), mitigation behaviours were specified but the scientific reasons for implementing these actions were not mentioned. Similarly, science-related concepts, such as 'greenhouse effect', 'too many CO_2 emissions' and 'carbon footprint', were included in participant 9's category 'Greenhouse effect and its effect on the world', but detail about the science behind these concepts was not included. This highlights the fact that, even though in many cases there was a breadth of understanding about climate change, the interviewees displayed a 'lay' knowledge of the issue (Bulkeley, 2000).

4.1.3.4 Differences between cognitive maps

Figures 4.1, 4.2 and 4.3 show the full cognitive maps of three participants. These three participants were chosen as examples to show the variety of cognitive maps obtained throughout the interviews. In relation to the major themes identified during this analysis, participant 9 produced a broadly coherent map (in the sense that concepts from the same major theme are consistently placed in the same category) with a large number of different categories that were all assigned to different major themes, whereas participant 11's map had fewer categories some of which were assigned to the same major theme. Participant 6 was sceptical about climate change and this view can be seen to permeate his whole cognitive map.

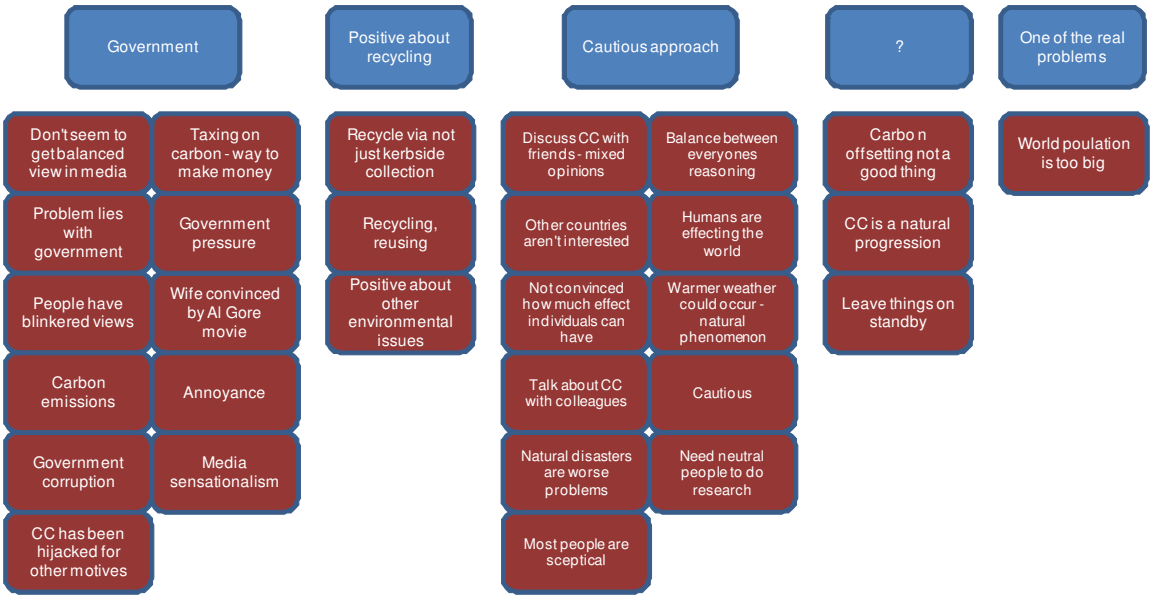


Figure 4.1: The cognitive map of participant 6

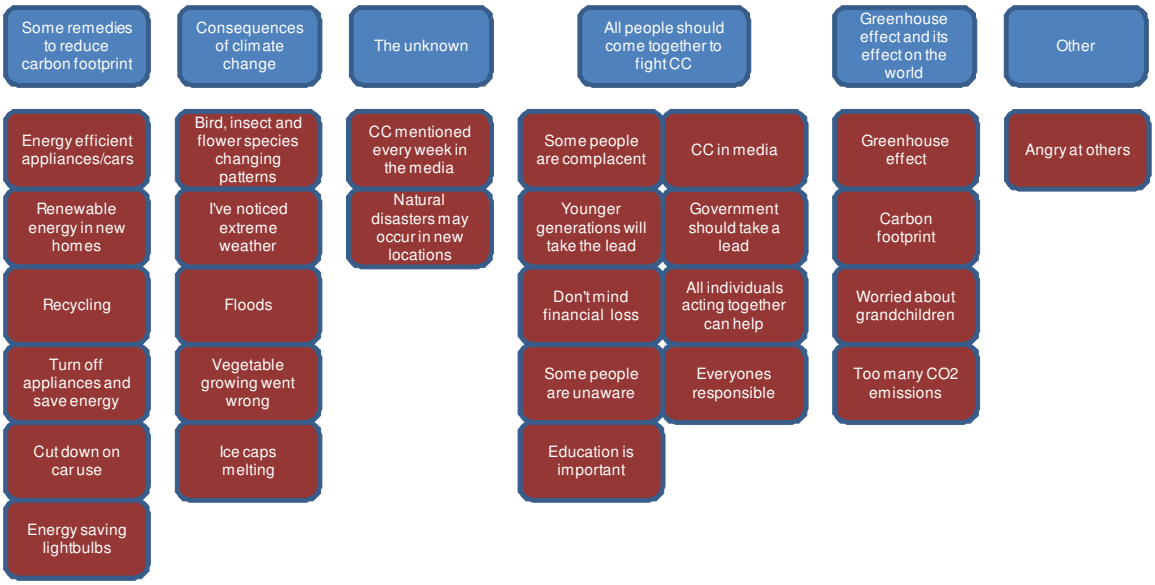


Figure 4.2: The cognitive map of participant 9

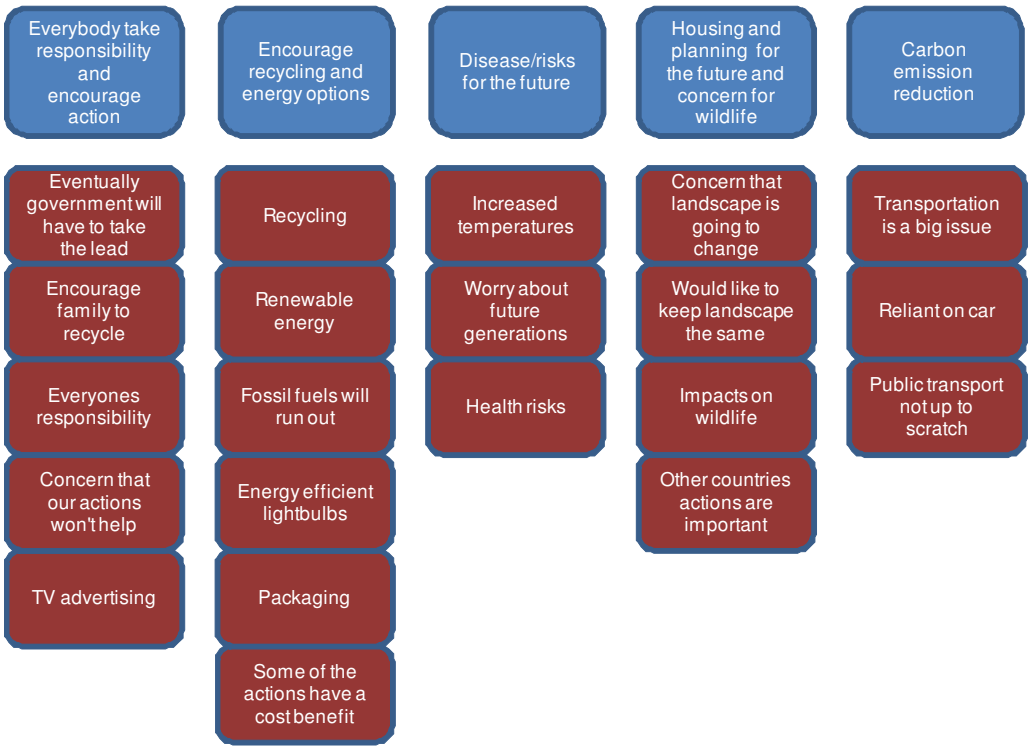


Figure 4.3: The cognitive map of participant 11

A sceptical position about climate change was relatively rare amongst the study subjects: two participants out of twenty were identified by the researcher as sceptics based on their opinions at interview, which equates to 10% of the study group. Scepticism was represented throughout the cognitive maps of the two sceptics, suggesting that it tended to permeate their thoughts. For example, consider the 3CM of participant 6, a climate change sceptic who created a cognitive map with five categories and 29 concepts (see figure 4.1). The five categories were placed in two of the major themes identified: the categories 'Positive about recycling' and ' "?" ' were placed in the 'mitigation' major theme: and categories 'Government', 'Cautious approach' and 'One of the real problems' were placed in the 'views and feelings' major theme. Evidence of a sceptical position was present in individual concepts in each of these five categories, regardless of the overall theme: the category 'Government' included the concepts 'taxing on carbon - way to make money' and 'climate change has been hijacked for other motives'; the category 'Cautious approach' included the concepts 'warmer weather could occur - natural phenomenon' and 'not convinced about how much effect individuals can have'; and a concept placed into the category '?' suggested that 'climate change is a natural progression'.

Figure 4.2 shows the cognitive map of participant 9, who was a member of three environment-related groups (National Trust, Royal Society for the Protection of Birds and World Wildlife Fund). Participant 9 had knowledge of a wide range of issues related to climate change and each of the six categories they produced was placed into one of the six different major themes: 'Some remedies to reduce carbon footprint' was placed into the 'mitigation' major theme; 'Consequences of climate change' was placed into 'impacts'; 'The unknown' was placed into 'information sources'; 'All people should come together to fight CC' was placed into 'responsibility'; 'Greenhouse effect and its effect on the world' was placed into 'causes'; and 'Other' was placed into 'views & feelings'. Looking at the individual concepts collated under each category reveals that participant 9 was able to place individual concepts into an articulate cognitive map that covered all major themes identified in this study. Further evidence of this comes from the second stage of 3CM data analysis, where concepts were transferred by the researcher into more appropriate categories. In the case of participant 9, only 22% of the concepts (six out of 27) were transferred at this stage, which is fewer than most other participants. It can be seen that, in addition to having knowledge of a range of issues related to climate change, participant 9 also has a coherent understanding of how the issues can be separated from one another. Figure 4.3 shows the cognitive map of participant 11. Considering the individual concepts, it is evident that they cover most of the major themes identified in the analysis (the only theme to which an individual concept was not assigned was the 'causes' theme). However, the five categories were assigned across only three major themes and 29% of the concepts (six out of 21) were moved to other major themes during the next stage of the analysis. This suggests that the coherence displayed in the cognitive map of participant 9 is less evident in participant 11's cognitive map.

Broadly speaking (and highlighted in the evidence above), interviewees possessed a wide knowledge about climate change at the conceptual level as they articulated a range of concepts at interview. However, the manner in which concepts were placed into categories varied between participants, suggesting that some people have a more coherent view of climate change. Furthermore, as mentioned in section 4.1.3.2, the actual knowledge structures at both the concept and category levels were similar for sceptics and non-sceptics, However, the lack of belief about the existence of the climate change problem was the first and foremost thought of the sceptics as it tended to be present throughout their whole cognitive maps.

4.1.4 Identifying representative concepts for structured 3CM

4.1.4.1 Identifying representative concepts

The next stage of the analysis involved analysing the individual concepts to identify a number of representative concepts that were shared across participants. 53 representative concepts were

identified and are listed in tables 4.4 to 4.9, below. The tables are organised by major theme and up to 3 examples of the individual concepts that were combined to create the representative concepts are given. Section 4.1.2 describes the decision rules for this part of the analysis.

	'Impacts' representative concepts	**Examples of participant-generated concepts combined to create the representative concept**
1	Positive impacts	Positive impacts; not all impacts are bad; and some positives can come out of climate change.
2	Changes in weather patterns	Unpredictable weather; changes in weather; and patterns of seasons is changing.
3	Effects on nature	Effect on wildlife and plants; wildlife impacts; and species migration.
4	Health impacts	Health benefits from warm weather; and health risks.
5	Temperature rises	Getting hotter; temperatures going up; and global warming.
6	Extreme weather	Hurricanes; stronger storms/floods; and natural disasters may occur in new locations.
7	Flooding	Local floods; and flooding will be more common.
8	Sea level rises	Rise in sea levels; and coastlines move landwards.
9	Melting ice caps	Polar ice caps melting; and ice melting.
10	Impacts on humans and society	Human impacts; economic/social impacts; and mass migration could occur.
11	Impact on food production	Vegetable growing went wrong; food production impacts; and different crops could be grown.
12	Worse impacts on poor people	Less well will tend to suffer more; and poorer countries will receive bad impacts.
13	Knock-on effects	Climate change has knock-on effects; and secondary impacts.
14	Wider environmental issues	Global impacts; and wider environmental impacts.

Table 4.4: 'Impacts' representative concepts identified during the second stage of data analysis.

	'Mitigation' representative concepts	**Examples of participant-generated concepts combined to create the representative concept**
1	Legislation and policy	Tighter legislation could help; and taxing on carbon - way to make money.
2	Renewable energy	Micro-scale wind turbines; solar panels; and wind farms.
3	Technological solutions	Technology has it's value; and think nuclear power will be needed.
4	Recycling	Composting; recycling is easy now that got the facility; and recycling could be easier.
5	Energy saving light bulbs	Energy efficient light bulbs; and low energy light bulbs.
6	Reduce energy use	Save energy; energy conservation; and we must save energy.
7	Sustainable transport	Cut down on car use; transportation is a big issue; and reduce car use/increase public transport.
8	Cost	Cost is a factor; don't mind financial loss; and money could be saved.
9	Stop flying	Holidays at home; flying once a year is OK; and flying is an issue

		- difficult to change.
10	Insulation	Cavity wall/roof insulation; payback for insulation is a long time; and insulation saves money.
11	Individual actions	Small actions are important to me; individual actions might not make a difference; and cumulative effect of individual actions.
12	Packaging	Avoid over-packaged items; and buy things with less packaging.
13	Food decisions	Growing own food has lots of benefits; and buy local produce.
14	Water wastage	Water wastage is a problem; and reduce wastage of water.

Table 4.5: 'Mitigation' representative concepts identified during the second stage of data analysis.

	'Information sources' representative concepts	**Examples of participant-generated concepts combined to create the representative concept**
1	Ozone layer	Hole in the ozone layer; and ozone layer.
2	Media hype	Media sources - could be sensationalised; and don't seem to get a balanced view in media.
3	Scientific evidence	Scientists could have more information; research; and climate history - peaks and troughs.
4	Information at work	Work try to instill positive environmental values; hear about climate change at work; and talk about climate change with colleagues.
5	Information from media	Watch documentaries; Al Gore film; and TV advertising.
6	Awareness is high	Raising awareness; more aware of climate change; and climate change always on the agenda.
7	Education	Education of younger generation; and education is important.
8	Discuss with family and friends	Try to educate friends/family; and husband encourages me to do stuff.
9	Don't think about climate change often	Don't know enough about climate change; talk about climate change in passing; and interest in climate change comes and goes.

Table 4.6: 'Information sources' representative concepts identified during the second stage of data analysis.

	'Causes' representative concepts	**Examples of participant-generated concepts combined to create the representative concept**
1	Carbon emissions	Carbon footprint; and too many CO2 emissions.
2	Polluting industry	Industry impacts on climate change; and pollution causes climate change.

Table 4.7: 'Causes' representative concepts identified during the second stage of data analysis.

	'Responsibility' representative concepts	**Examples of participant-generated concepts combined to create the representative concept**
1	Government responsibility	Governments should do more; government should take the lead; and annoyed at government inaction.
2	Individual responsibility	All individuals acting together can help; too much responsibility given to individuals; and everybody's responsibility.
3	International co-operation	International equality important; China and India developing fast;

		and America needs to do more.
4	Company profits	Profits of multinationals; big companies are powerful; and supermarkets bottom line is profit.
5	Other people should act	People act irresponsibly; people can do more; and 'difficult to get others to act.

Table 4.8: 'Responsibility' representative concepts identified during the second stage of data analysis.

	'Views & feelings' representative concepts	Examples of participant-generated concepts combined to create the representative concept
1	Natural phenomenon	Natural causes; climate change is a natural progression; and most people are sceptical.
2	Government corruption	Problem lies with government; and government pressure.
3	Climate change is happening	Belief that climate change is occurring; and believe climate change is happening.
4	Resignation	Pessimism; the damage is already done; and doom and gloom.
5	Unconcerned	Ambivalent; and not particularly worried.
6	Worry	Scary; worries me intermittently; and worried about grandchildren.
7	Angry at others	Annoyance at sceptics; frustrating; and George W Bush is an idiot.
8	Confused	Confusing; and climate change mixed up with recycling.
9	Climate change is caused by humans	What we're doing to the Earth; convinced climate change is man-made; and rate of change suggest human factor.

Table 4.9: 'Views & feelings' representative concepts identified during the second stage of data analysis.

4.1.4.2 Structured 3CM pilot study

The representative concepts identified above were used in a structured 3CM (Kearney & Kaplan, 1997) pilot study, to test their applicability and ensure that they could be used in future studies of climate change perceptions without further exploratory research. Participants were colleagues of the researcher from De Montfort University and were members of the social science research group at the Institute of Energy and Sustainable Development where the research was conducted. Three female researchers and four male researchers took part in the pilot study. The structured 3CM process is described by Kearney & Kaplan (1997) and the instructions for the 3CM task carried out as part of this research are presented in appendix 3. The reason for the pilot study was twofold: to discover whether each individual representative concept 'made sense' to the research subjects; and to see whether another group of people chose largely the same concepts in a different research setting and using a different methodology (i.e. they did not add a huge range of extra concepts to their 3CM). Given that the group was composed of academic researchers, the pilot study was also used as a general check on the methodology, research process and the range of representative concepts; after completing the structured 3CM under research conditions, subjects were asked

directly about their opinion on these matters and the results of the pilot study are briefly highlighted here.

The pilot study confirmed that the representative concept list was appropriate for future studies without further modification. The study subjects added few new concepts to their cognitive maps suggesting that most aspects of knowledge are covered by the representative list. The concepts that were added by the pilot study participants were all placed under one of the six themes identified during the earlier stage of the analysis, adding further credence to the coherence of the study and backing up the validity of the categorisations. The research participants considered the representative concepts and the methodology appropriate from an academic and subject perspective. Appendix 3 contains all the information and resources needed to carry out a structured 3CM study of knowledge about climate change including instructions and the list of representative concepts. This template could be used without modification in future studies as it is empirically derived from the results of the successful unstructured 3CM and a pilot structured 3CM study.

4.1.5 Research question 1 – key findings

Based on the analysis described above, the following key findings have been made in relation to individuals' perceptions of climate change:

- Interviewees had a broad knowledge of potential impacts of climate change, suggesting that interventions to raise awareness of climate change are not needed. The impacts specified by participants tended to be 'correct', in terms of scientific consensus (IPCC, 2001), suggesting a high understanding in this area.
- Interviewees were aware of a large number of appropriate mitigation behaviours that they could perform to reduce their impact on climate change. Participants tended to express their knowledge of the causes of climate change through giving examples of relevant changes in behaviour, rather than explicitly stating causes. This broad knowledge of how to mitigate climate change was reflected in the fact that participants who were sceptical about the existence of climate change actually included concepts highlighting mitigation behaviours. Even though sceptical participants did not believe that these behaviours could have any effect, they were aware of actions that were 'supposed' to reduce climate change.
- There was confusion amongst some of the participants about the difference between ozone layer depletion and climate change.
- The major themes relating to 'impacts' of climate change and 'mitigation' behaviours were generally consistent between participants as concepts about these issues were usually placed into a coherent category. Concepts relating to 'information sources' were often

placed across major themes. However, this is intuitive as the climate change information an individual receives can be about any aspect of the issue, such as mitigation or potential impacts.

- Interviewees were largely aware of the different scales (e.g. individual, local, governmental, international) at which societal responses to climate change can operate. Participants tended to think that everyone was responsible in some way for dealing with the problem, but that government should take a lead.
- Participants expressed a vast range of views and feelings about climate change. Those who believed in the phenomenon generally considered it to be a large problem that they were concerned about, but they did not necessarily believe that society would take the necessary steps to mitigate.
- Two out of the twenty participants were sceptical about the existence of anthropogenic climate change. Scepticism tended to permeate their range of thoughts, as many concepts and categories included sceptical rhetoric.
- Analysis of the content of whole cognitive maps was carried out by comparing the concepts elicited at interview to the major themes identified during the analysis. This showed that, even though most interviewees included individual concepts from each major theme, the coherence of the subsequent categorisations varied between participants. Some participants had logical cognitive maps, where categories were easily assigned to major themes, whereas other participants' maps were much less ordered.
- The knowledge articulated by participants was largely 'lay' knowledge about climate change. No participants expressly exhibited a deep scientific understanding of the issue and tended to talk about climate change in terms of global impacts and how it affected their daily lives.
- Climate change was seen as an environmental problem that was to be mitigated, rather than adapted to. Respondents did not tend to frame climate change in terms of the possible need to moderate lifestyles in order to live with a changing climate.

4.1.6 Research question 1 - discussion

In the conceptual content cognitive map (3CM) study, it was shown that interviewees had a large amount of knowledge about potential impacts of climate change. The prevalence of 'impacts' categories across participants suggests that this is one of the main issues that people consider important about climate change and one of the key windows through which they express their knowledge of the subject. Respondents, even those who are sceptical about climate change, were aware of a wide range of potential impacts of climate change, particularly those that relate to weather patterns and other physical impacts, such as retreating coastlines or flooding. Societal

impacts were also mentioned but specific examples were rarely given. For example, IPCC (2007) suggests that if more severe climate change happens, mass migration could occur as groups of people move to cooler areas of the planet. Other possible large-scale societal impacts include famine, as land becomes unable to support crop growth, or wars could begin as countries fight for their share of global resources (Ibid.).

The greater prevalence of physical impacts was also evident during the stage of the analysis when representative concepts were identified. Only two of the fourteen representative concepts were about human or societal impacts - 'impacts on humans and society' and 'worse impacts on poorer people' - and the individual concepts were largely general (i.e. 'human impacts') as opposed to specific (i.e. 'mass migration could occur'), whereas eight of the representative concepts were about specific physical impacts (i.e. 'sea level rises' and 'melting ice caps'). Future interventions should therefore not aim to increase awareness of potential physical impacts of climate change. This research suggests that people are already aware of a number of examples, so spending money on these kinds of interventions is unlikely to produce a large change in knowledge. Therefore, the 'awareness of consequences' (Stern et al, 1999) aspect of climate-related behaviour does not need addressing in relation to physical impacts. Concentrating on societal impacts may be more worthwhile, allowing individuals to relate directly to other people in different parts of the world who may suffer more severely and improving subjects' knowledge in this area.

Both sceptical and non-sceptical respondents knew of many ways to mitigate climate change, from small-scale individual actions to larger-scale interventions such as those at governmental and international levels. This suggests that knowledge of how to act to mitigate climate change is high (at least across the research group) and future interventions in this area are not necessary as they are unlikely to have a large impact on public knowledge. The fact that those sceptical about climate change knew of a number of ways in which the problem could be mitigated suggests that such knowledge is not always a pre-cursor to pro-climate perceptions and behaviour. Money could be better spent attempting to influence other climate change-related perceptions, such as encouraging individuals to believe the phenomenon is actually occurring. However, given the seemingly difficult task of changing an opinion that is engrained right across a sceptics thoughts, understandings and feelings about climate change, it makes sense to follow the advice given by Futerra (2005[b]) in their document of practical tips for climate change interventions and "ignore the sceptics" (Ibid.). Given the low percentage of people who do not believe in climate change (two out of twenty participants in the present study), this is unlikely to have a massive limiting effect on emissions reduction targets, particularly if other methods of regulation are brought in by government such as more stringent legislation or incentives to behave more positively towards the climate.

There was a very wide range of sources of climate change information across participants and much opinion about the nature of these sources. Comparing the features of the cognitive maps produced in this study with the positions on climate change identified by Ereaut & Segnit (2006, 2007) suggests that much of the information individuals receive about the subject is from the media. This contention is also supported by the present research, which identified two representative concepts (out of a total of nine information-related concepts) about the role the media play in supplying climate change related information. Many respondents thought that the media sensationalised the issue, and there was some scepticism about the climate change information received through this source. Another two important sources of communication were friends and family and work, and both these sources appeared to be trusted as, in contrast to media information, none of the respondents expressed a negative opinion about the information they obtained from them. As a great percentage of the general public is unlikely to read scientific literature, peer education and work-based initiatives appear to be important channels for future climate-related attitudinal interventions.

The analyses produced only four categories that were placed in the 'Causes' major theme and only two representative concepts about causes of climate change. However, as mentioned above, the fact that people are highly aware of mitigation behaviours suggests that they are aware that the opposite behaviours cause climate change. This accords with other published research (e.g. Bostrom et al, 1994; Hinds et al, 2002) which suggests people can identify causes of climate change. Based on the sample used in this qualitative study, there is quite a large awareness of carbon dioxide as a climate change-causing gas. Nearly half of the interviewees mentioned 'carbon' in at least one of their concepts and two category labels were specifically about reducing carbon emissions. This suggests that 'carbon emissions' or 'carbon dioxide emissions' is used as a frame of reference through which lifestyle choices to reduce individuals' impact on climate change are expressed. 'Carbon' may therefore be an appropriate frame around which future interventions could be designed, compared to 'climate change' or 'the greenhouse effect' (cf. Whitmarsh, 2009a).

It has been argued that an in-depth knowledge of the science behind climate change is not necessary for individuals to perform mitigation behaviours (Bulkeley, 2000); indeed this was a central theme in the literature describing the rationale for the UKCCCI (Futerra, 2005a,b). This is undoubtedly true, as, for example, many people save energy for economical reasons without even thinking about their carbon emissions. This 3CM study has discovered that individuals are aware of the consequences of their actions (changes in climate) and they know a wide range of behavioural responses to reduce their impact. As such, the results support Bulkeley's (2000) conclusions. The

study has also shown that interviewees generally do not exhibit “fuzzy environmentalism” (Bostrom et al, 1994) as they were often quite aware of the specific nature of the climate change problem, but there was still confusion amongst some participants between climate change and ozone depletion (Boyes & Stanisstreet, 1998; Kempton, 1993; Gowda et al, 1997). However, based on anecdotal interpretation of the research interviews, those individuals who had a broader knowledge appeared to be more committed to reducing their carbon emissions. This implies that an understanding of the science behind climate change may make people more likely to act to reduce their impact. Alternatively, it could be the case that those interested in reducing their emissions are more interested in the subject and tend to seek out further information. The link between scientific knowledge and behaviour represents a potential avenue for future research.

Pawlik (1991) specified five reasons why climate change is inadvertent in psychological terms, which made it less likely that sufficient societal response to solve the problem would occur. It is argued, based on the 3CM analysis, where the media was identified as a key source of climate change information, that this is no longer the case and the proliferation of climate change information, particularly in the media (Ereaut & Signaut, 2006, 2007), has bypassed these issues. For example, Pawlik (Ibid.) argues that the increase in extreme weather events associated with climate change is unlikely to register with individuals due to the fact that even though their relative frequency will increase, they will still be a rare occurrence. The intense media coverage of the hurricane that devastated the city of New Orleans in 2005 is an example of how this psychological barrier may be being bypassed.

Assigning responsibility for causing and mitigating climate change was an important issue for most respondents and was reflected by the 14 categories assigned under the ‘Responsibility’ major theme. There was a general appreciation that climate change was a global phenomenon and that action was needed at all levels of society if mitigation attempts were to be successful. This latter point was reflected by the three levels of society that were allocated responsibility in the representative concepts produced during the analysis: individuals (including interviewees stating that both they themselves, and other people, were responsible); government; and international level. A general appreciation of the scale of the problem can be inferred from this result. Furthermore, many of the interviewees expressed the contention that government should take the lead or do more about this issue. This suggests that if the UK government do implement contextual changes (Halpern et al, 2004), they may well find that the public are willing to support their policies. This is important given the recent Climate Change Act which gave government a legally-binding responsibility for year-on-year carbon emissions cuts (DECC, 2009). The results of this study suggest that the population may be willing to do their bit to assist government in reaching their

targets. The broad-ranging ascriptions of responsibility for mitigating climate change by the interviewees highlights an awareness of the sheer size of the climate problem. Action at every societal level will be necessary to prevent the worst impacts associated with climate change (IPCC, 2007) and these results indicate that people are aware of this.

In contrast to Whitmarsh (2009a), who concludes that there is widespread scepticism about the reality of or human causes of climate change, interviewees tended to express the belief that climate change was occurring (and several people directly stated that it was caused by humans). The views of the respondents in this study reflected the views highlighted in Lorenzoni & Hulme's (2009) paper, which reported that 87% of people blame human activity for causing climate. However, they used largely negative language and their cognitive maps tended to suggest that the phenomenon was something to be feared and that the action necessary to mitigate the problem was unlikely to be taken. This is highlighted by the fact that four out of the nine 'views and feelings' representative concepts were negative feelings: 'resignation'; 'worry'; 'angry at others'; and 'confused'. This was also reflected by the fact that only one individual concept throughout the study suggested that an interviewee had 'positive feelings'. Such negative thoughts appear unlikely to lead people to behaviour change as they appear resigned to major changes in climate.

Given the above, it is important that future interventions do not promulgate negative views, but give a positive message. If an intervention is primarily about what large-scale impacts are likely to occur, then this is the message that subjects are going to take home. This, coupled with the media portrayals of large-scale physical impacts (Ereaut & Segnit, 2006, 2007), could be why there were so many physical impacts mentioned in this study; it has already been suggested above that there is no longer any need to increase the public's awareness of physical climate change impacts. Analysing the category labels and representative concepts placed under the 'views and feelings' major theme provides further evidence in support of this contention. Given that the interviewees generally thought that society would not respond appropriately to climate change, it may be worthwhile for future interventions to emphasise a positive message about climate change and highlight the opportunities that it represents. For example, installing renewable technologies could increase the security of energy supply and potentially save money for individuals in the long-run. There are also a large number of business opportunities and if people understand these positives, they may be more likely to engage with the climate change agenda.

In agreement with Lorenzoni et al (2007), who discuss a heterogeneous public with varying conceptualisations of climate change, this study has shown that people tend to think about climate change in terms of their existing knowledge structures and via things that are relevant to their

everyday lives. For example, Wellingborough Toolkit interviewees that worked for the Borough Council of Wellingborough mentioned the council's work on climate change in their cognitive maps. This is because they are exposed to 'work-related' climate change information on a regular basis and then relate it their own actions and lifestyle choices. In relation to future communications these findings imply that, because each individual has different perceptions, different interventions are likely to be required for different people.

Lorenzoni et al (2007) also identified specific barriers to individual engagement with climate change (see section 2.3.2). Below, the results of the 3CM study are compared to the identified barriers to see whether or not they are evident in the sample of twenty people interviewed for this thesis. Implications for future communications are also noted.

- Generally, respondents did not display a lack of knowledge about climate change, either in terms of its causes, consequences or possible solutions. As highlighted above, notable exceptions to this were human or societal impacts and the need to adapt to any changes that are going to occur from previous and current greenhouse gas emissions. Communications therefore should only be targeted at certain aspects of climate change-related knowledge.
- Other than the two sceptical interviewees from the sample of twenty, people generally thought that climate change was anthropogenic and that it was a serious problem. The large number of concepts relating to individual action also implies that people believe that personal action can contribute to mitigation efforts. Despite the fact that respondents did believe in the utility of personal actions, the analysis did suggest that government and industry were considered the key players in relation to both responsibility for causing climate change and mitigation actions. Communications efforts should therefore aim to redress this balance and emphasise the key role that individuals working together can play. This could also increase self-efficacy and prevent people from feeling helpless as an individual facing such a large-scale global problem. Additionally, it might also reduce individuals' concerns about 'free-riders' (other people not making a fair contribution to mitigation efforts, Ibid.)
- There is a lot of mistrust in the media and its reporting on climate change, but it is also one of the major sources of climate change information. People tend to trust their colleagues and peers, and given the likelihood that the media will continue to sensationalise climate change (Ereaut & Signaut, 2006, 2007) to sell more papers, this implies a key role for work-based projects and peer education in future communications interventions.
- Respondents did tend to think that climate change was an issue that was a distant threat in space and time, as evidenced by the large number of wide-scale physical impacts identified

during the mapping process. In order to bring impacts down to a more local level, future interventions could use specifically-designed imagery and photomontages (Spence & Pidgeon, 2010) with meaning to people's everyday lives, such as the images created for the WT project.

In the discussion above, we have explored the themes evident from the 3CM data and considered the extent to which various climate change subjects and issues were represented across a sample of 20 interviewees. Recommendations about future communications interventions were made based on the extent of knowledge across interviewees. In addition to exploring the concepts and categories elicited during the interviews it is equally important, in terms of designing future interventions, to consider what was not mentioned. The fact that climate change adaptation was not mentioned by any of the participants, including the academic researchers involved in the pilot structured 3CM study, suggests that this is not an issue prevalent in the minds of the research interviewees when they think about climate change. With regard to the impact of the communications using UKCCCI funding evaluated here, this is hardly surprising as the project guidance implied that only 'mitigation' frames of reference should be used in individual communications projects (Futerra, 2005a). However, as the emissions already released into the atmosphere are going to cause some changes to the natural systems upon which humans rely (IPCC, 2007), it is important that future interventions do, in some way, include 'adaptation' frames of reference.

4.1.6 Research question 1 - conclusions

Research question 1 used conceptual content cognitive mapping to explore how people perceive climate change. Data from a sample of 20 interviewees were analysed and showed that people tend to think about the issue in terms of six themes, which were described and explored in detail. Some themes were much more prevalent than others including the identification of likely physical impacts of climate change and possible mitigation behaviours, and the 'lay' knowledge displayed by participants was largely scientifically accurate. Full cognitive maps were analysed and also compared between participants, which showed that individual maps have varying levels of 'order'. Few interviewees were sceptical about climate change and some confused the issue with ozone layer depletion. In addition to identifying how people perceive climate change, the results were explored to suggest implications for future communications. Finally, a list of representative concepts that can be used for future structured 3CM studies were produced; this list has been tested by a group of academics and is ready to use for a future research project to identify whether the perceptions of the sample used in this study are to be found across broader society.

4.2 Comparing climate change perceptions at the national and regional level

4.2.1 Introduction

The second research question to be addressed relates to the rationale behind Defra's UK Climate Change Communications Initiative (UKCCCI), which involved the devolving of communications from a national level to a regional and local level. This part of the analysis considers whether this approach is valid, by comparing national perceptions of climate change to the perceptions of the target audience of the 'Everybody's talking about climate change' ('ET') project before the intervention took place. By considering the extent to which perceptions differ, conclusions can be made about the usefulness of Defra's approach. As mentioned previously, the Central Office of Information (COI, 2006, 2007) carries out biannual surveys of a representative sample of England's citizens to monitor perceptions of climate change. A sample of the ET project's target audience were asked the same questions in early 2007 and the results were compared to those obtained by the COI in its fourth nationwide survey carried out in October 2006. The purpose of this comparison was to identify any areas where the target audience differed from the English population in their perceptions of climate change. Reports on the COI surveys only supply descriptive data and not the entire dataset of individual responses. Therefore, we can compare these national descriptive statistics to the ET projects' descriptive statistics, but it is not possible to test for the statistical significance of any differences. Many of the survey questions had 'Unsure' as a response option. When comparing project data to COI data, only valid responses were included in the analysis. All instances in which respondents answered 'Unsure' were removed using pairwise deletion. This means that the percentage of respondents answering each question (referred to in text and graphs in the next section) is the 'valid' percentage.

The demographic make-up of respondents by dataset was as follows:

- The COI sample comprised 49% males and 51% females. Age-wise, 11% of the sample was aged 18-24 years, 69% aged 25-64 years and 20% were aged 65 years or more.
- According to the UK Census (2001), breaking down the UK population into the same age bands as noted above would give the following percentages: 18-24 years 11%; 25-64 years 68.5%; and 65 years and over 20.5%. The percentages by gender of the UK population are 49% male and 51% female. As such, the COI data is nationally representative.
- The sample collected for the ET survey was closely representative of the national population in terms of gender with 50.3% females and 49.7% males, but skewed towards the older age group: 7.8% were aged 18-24 years, 30.7% were aged 25-64 years and 61.4% were 65 and over.

Consequently, it was important to explore whether the descriptive statistics from the ET survey were influenced greatly by the large number of respondents in the older age group. In order to address this issue, the N&D results were weighted by age so that they could be accurately compared to the national sample. The weighting was done by multiplying the average result for each age group in the sample by the percentage of that age group in the underlying population. This ensured that any conclusions based on the analysis were not erroneously ascribed to actual differences between the two populations (rather than demographic differences between the samples).

4.2.2 Comparing national data to 'Everybody's talking about climate change' data

Respondents to both surveys were asked whether they had heard a number of terms that relate to the environment. Table 4.10 shows the percentage of respondents answering 'yes' and shows the general nationwide and local (i.e. within Nottinghamshire and Derbyshire) awareness of climate change issues. The table shows that residents of the two counties reported a slightly higher awareness of five of the six terms mentioned. They were also asked to what extent they agreed that the world's climate is changing (agree strongly, agree slightly, disagree slightly, or disagree strongly) and to what extent they thought climate change was a result of human behaviour or natural changes. Residents of the two counties appeared less sure that the climate is changing than the wider UK population (64.7% and 72.8% strongly agreeing, respectively) and appeared less certain that human activity was the main contributing factor (73.5% of N&D residents stated CC was mainly or entirely due to human behaviour compared to 78.9% of the wider UK population).

Respondents were asked if they thought that they personally contributed to a number of activities that impact on climate change. Table 4.10 shows that residents of the two counties were more likely to report that they personally contribute to climate change across the range of activities, except via 'burning fossil fuels for energy'. This is particularly interesting as there is a large percentage difference between the two studies. It seems likely that all respondents do, in some way, use energy from fossil fuels. The low percentage of N&D residents (43.3% as opposed to 71% nationally) who agreed that they do contribute suggests that residents of the two counties have a relatively low level of knowledge of energy generation issues.

Respondents were given four semantic differentials (pairs of words with opposite meanings) and asked which word from each pair best reflected their attitude towards CC. The results for each pair of words are shown in Table 4.10. The overall percentage of positive and negative choices was ascertained by combining the results from each individual question. Residents of the two counties were more likely to choose the more positive option (64.0%) than the wider UK population (50.2%), suggesting that they have a more optimistic outlook about climate change.

Question			% of respondents in ET survey (weighted)	% of respondents in UK survey
Were you aware of the following terms before today?	Global warming		99.0	98.0
	Climate change		98.8	97.0
	Greenhouse effect		95.9	95.0
	Carbon dioxide		98.6	95.0
	Carbon emissions		92.4	90.0
	Climate change gases		82.5	89.0
To what extent do you agree that the world's climate is changing?	Agree strongly		64.7	72.8
	Agree slightly		35.1	24.2
	Disagree slightly		0.0	2.0
	Disagree strongly		0.2	1.0
To what extent do you think climate change is a result of human behaviour or natural changes?	Due entirely to human behaviour		15.5	20.0
	Due mainly to human behaviour		58.0	58.9
	Due mainly to natural changes		24.8	17.9
	Due entirely to natural changes		1.6	3.2
Which of the following do you personally contribute to?	Emissions from cars/vans/buses		81.4	77
	Carbon dioxide emissions		77.2	76
	Pollution		74.4	72
	Burning fossil fuels for energy		43.3	71
Which of the following pairs of words best reflects your opinion about climate change?	1.	Hopeful *or*	47.7	47.4
		Fearful	52.6	52.6
	2.	Motivated *or*	83.5	72.9
		Unmotivated	16.5	27.1
	3.	Positive *or*	72.6	56.7
		Negative	27.4	43.3
	4.	Enthused *or*	52.2	23.9
		Frustrated	47.8	76.1

Table 4.10: Comparing the percentage responses in the Nottinghamshire and Derbyshire and national surveys.

In addition to the results highlighted in table 4.10, further questions were asked in both surveys. Concern about climate change was slightly higher among the N&D sample. 'Average concern' was measured by giving a different number of points depending on the answer given by a respondent. One point was given for 'not at all concerned', two for 'not very concerned', three for 'fairly concerned' and four for 'very concerned'. This showed a very similar level of concern in both surveys with the N&D weighted sample averaging 3.15 and the nationwide sample averaging 3.09.

Respondents were asked to what extent they believed that various individuals and groups could influence climate change. On average, the N&D population reported that the three groups about which they were asked (UK government; industry and businesses; and the local community) could have less impact on CC when compared to the nationally representative sample. Furthermore, the N&D sample stated that industry and businesses could have the most influence, whereas the wider UK population said that the government is most influential. However, when asked about their personal influence on climate change, N&D respondents were more likely to state that they could have 'some' or 'a large' influence (42.4%) than the national sample (26.3%), suggesting a greater belief in the efficacy of individual actions in the two counties.

The survey also asked respondents where they heard about climate change and the percentage of N&D residents hearing about CC was higher than the national sample for seven of the eight sources in the survey. For example, over 20% more of the N&D weighted had heard government or politicians talking about CC and over 20% more had discussed the issue with friends or family. People from Nottinghamshire and Derbyshire tended to talk about climate change more often with their peers. The weighted percentage of N&D residents discussing CC at least once every month was 67.1%, compared to 46.0% of the UK population.

4.2.3 Research question 2 – key findings and discussion

The first quantitative dataset was analysed to answer research question 2. The results reported above have shown, through a comparison of two sets of survey results, that there are differences between national and regional perceptions of climate change (at least in the East Midlands counties of Nottinghamshire and Derbyshire). Relative to a national sample, citizens of Nottinghamshire and Derbyshire were more positive in their perceptions of some aspects of climate change, but had more negative perceptions in relation to other aspects.

The descriptive statistics from the N&D sample were weighted demographically and compared to a nationally-representative survey, which used the same questions. As noted above, a comparison of descriptive statistics shows that N&D respondents were more positive about some aspects of CC than the national sample, but less positive about others. Awareness of climate change terms appeared to be high throughout the country and, even though the N&D sample showed a slightly lower average concern, the results of the two surveys are very similar in this regard. This accords with the idea (expressed by Defra in its UKCCCI) that people already have a very high awareness of CC and projects must now focus on other precursors of behaviour, such as attitudes (Futerra, 2005a). N&D residents were less likely to agree strongly that the climate is changing than the UK population were (however, most respondents to both surveys did agree to some extent that CC is

happening). N&D residents were also less likely to state that CC is a result of human behaviour and tended to report that they were not personally contributing to climate change. Particularly interesting here was the very low number of N&D respondents who said they contributed to burning fossil fuels for energy compared to the UK sample. It seems reasonable to suggest that the Nottinghamshire & Derbyshire population may require further education about these issues. There were some issues explored in the two surveys on which N&D residents answered more positively than the UK population. Residents of the two counties reported that they personally could have more influence on climate change and they had more positive attitudes towards CC than the UK average (as measured by their responses to the question that used a semantic differential).

This study has shown that there were differences between average national perceptions towards climate change and average perceptions in the two counties of Nottinghamshire and Derbyshire, but due to the nature of the two samples it was not possible to test the statistical significance of these differences. There are sufficient differences in the descriptive statistics to conclude that perceptions differ sufficiently at different societal scales (national versus local) to warrant a devolved, de-centralised approach to climate change communications. This, although perhaps unsurprising, has previously been unacknowledged in government interventions around climate change (Collins et al, 2003). Residents of different areas of the UK live in different contexts (geographical and socio-cultural) and their perceptions are likely to vary accordingly. As Whitmarsh (2009a) points out, communications should be framed differently for different groups of people depending on their existing perceptions; this will likely result in more effective interventions. Through the UKCCCI, Defra devolved communications groups away from central government to smaller projects, allowing the sponsored organisations to design and implement their own communications. The results of this study, along with the results reported in relation to research question 1 (see section 4.1.6) and described in the literature review (e.g. Lorenzoni et al, 2007), suggest that this is an appropriate method and future large-scale climate change communications initiatives should devolve communications to lower levels.

4.2.4 Research question 2 – conclusions

In conclusion, the analysis reported above has shown that attitudes differ sufficiently at different societal scales (e.g. national versus local) to warrant a devolved, de-centralised approach to climate change communications and that the approach adopted by Defra for the UK Climate Change Communications Initiative (Futerra, 2005a,b) was appropriate.

5. Climate change communications interventions

Chapter 5 of the thesis addresses the second broad research aim identified in table 3.1: how can an analysis of practical climate change communications projects inform future interventions? Section 5.1 analyses quantitative data collected before and after each case study intervention to answer research question 3: do individuals' perceptions of climate change differ after taking part in communications projects? Section 5.2 draws on the quantitative survey data collected for the 'Everybody's talking about climate change' project to answer research question 4: can value be added to communications campaigns by segmenting the target audience using socio-demographic variables? Finally, section 5.3 reports the template analysis of qualitative interview data to answer research question 5: what do people, who have taken part in specific climate change communications, think about the interventions? The overarching aim of this chapter is to use the answers to the research questions to identify strategies for future communications interventions.

5.1 Comparing perceptions before and after the interventions

5.1.1 Introduction

This section of the analysis compares those surveyed before and after the intervention via descriptive statistics and uses between subjects tests, such as independent samples t-tests, to identify any statistically significant differences between responses pre- and post-communication. Some explanation of the way in which the results have been analysed is necessary. In order to carry out statistical analysis it is essential to have a dataset in which cases (i.e. individual respondents) give responses to a range of variables (i.e. survey questions). This means that the responses of individuals and groups of individuals can be compared to each other and significance tests can be carried out. As the study did not track individual's perceptions before and after the communications and the two surveys are therefore effectively independent (even though in some cases the post-intervention sample included some of the same people as the pre-intervention sample (see section 3.3.4), between subjects statistical testing is the appropriate method (Field, 2005).

The relevant statistical test to identify whether there were significant differences pre- and post-communication depended on the nature of the outcome variable being tested, as it was already determined that the predictor variable – whether or not the subject had been subject to the communications – was categorical with two potential outcomes (i.e. taken part in the 'before' or 'after' survey). For example, the outcome variable may be categorical in nature (e.g. with response options 'yes' or 'no': were you aware of the phrase global warming before today?), or it may be continuous (e.g. with response options assigned the following values: 'agree strongly' – 1, 'agree slightly' – 2, 'disagree slightly' – 3, and 'disagree strongly' – 4: do you agree or disagree that the

world's climate is changing?). Additionally, if the data are not normally distributed, then a non-parametric test must be carried out. There are three different tests that could be used to explore the data in this way: Pearson Chi-square, in cases where the outcome variable is categorical; independent t-test, in cases where the outcome variable is continuous and the data meet the assumptions of normality; or Mann-Whitney test where the outcome variable is continuous but the data are non-normal.

In the analysis below, the relevant test results are reported only if a significant difference between the before and after surveys is identified (i.e. the statistical tests were run for all the questions and non-significant results are not reported) and the test assumptions have been met. For example, chi-square tests carried out on data with two categorical variable each having two categories assumes that all expected cell counts should be greater than five (Ibid.). In addition to the test results, the effect size (r) is reported for all significant t-tests, which gives an objective measure of the importance that the independent variable (in this case taking part in the pre- or post-communication survey) has on the dependent variable. Cohen (1988) suggests the following guidelines for interpreting r: r = 0.1, small effect; r = 0.3, medium effect; and r = 0.5, large effect. For significant chi-square tests, the odds ratio is also reported, which indicates how much more likely respondents are to answer in a certain way.

The pre- and post-communication data were collected via various means as discussed in chapter three (e.g. paper and online survey) and all the responses were entered into an SPSS (Statistical Package for the Social Sciences) file. Many of the questions had 'Unsure' as an option. When comparing pre- and post-intervention data, only valid responses are included in the analysis; all the cases where respondents answered 'Unsure' have effectively been removed from the analysis. This means that the percentage of respondents giving specific answers (referred to in text and graphs in the next section) is the 'valid' percentage and does not include the individuals who were unsure. This chapter is broken down into three sections, each dealing with one of the case studies. Within each section, results from each survey question are explored and significant differences between the 'before' and after samples are identified. The significant results are displayed graphically. The percentages in the graphs may not always total 100 due to rounding.

5.1.2 Comparing pre- and post-communication perceptions for 'Everybody's talking'

5.1.2.1 Survey results and analysis

Respondents were asked whether they had heard of a number of terms that relate to the environment. Out of the six terms that were included in the questionnaires, a greater percentage of respondents were more aware of three terms and less aware of three terms post-intervention,

although none of the differences were statistically significant. However, this was relatively unimportant as the percentages were very high pre- and post-intervention. The high percentage of respondents answering 'yes' in both surveys reflects a general awareness of climate change issues amongst the target audience of the ET campaign. The objective of the ET campaign was to encourage citizens of the two counties to feel a sense of agency about their ability to tackle climate change. The reasoning behind this objective was that people already had a high awareness of the issue and that they required communications to change their perceptions, not to raise their awareness. These data therefore suggest that the objective of the ET project was sound.

Respondents were asked to what extent they agreed that the world's climate is changing (agree strongly, agree slightly, disagree slightly or disagree strongly). The extent of agreement in Nottingham and Derbyshire reduced over the course of the campaign with a lower percentage of people agreeing and a higher percentage disagreeing in the post-communication survey. Furthermore, a greater percentage of respondents disagreed strongly that the climate was changing in the post-intervention survey. In both surveys, there were relatively few respondents that did not agree to some extent that climate change was happening and the low percentage of sceptical individuals suggests a general consensus about the existence of climate change amongst Nottinghamshire and Derbyshire residents.

Respondents were also asked whether they thought climate change is due to human behaviour or natural changes. In both the pre- and post-surveys, there were a large number of individuals who answered 'unsure'; 22.8% and 24.3%, respectively (as noted earlier, these respondents are not reflected in the percentages given here, as only 'valid' responses are included). However, there was an increase in the percentage of respondents who thought human action was responsible, with the percentage rising from 52.7% to 54.2% over the course of the campaign. On the other hand, there was an increase in the percentage of respondents who thought that climate change is entirely due to natural changes.

Respondents were asked if they thought they personally contributed to a number of climate-related problems. This was used to gauge the extent to which people realised that their own actions impacted on the climate. The questions were designed in such a way that nearly all respondents should answer 'yes' to all the questions if they had knowledge of the consequences of their own activities (for example all individuals contribute to carbon dioxide emissions in some way, even if they lead a low-carbon lifestyle). As shown in figure 5.3, the percentage of respondents who agreed that they contribute to all the climate change-related behaviours increased over the campaign period.

There was a large increase in the percentage of people in Nottinghamshire and Derbyshire who thought that they contributed to burning fossil fuels for energy (from 39.3% to 57.3%) and this change was statistically significant [X^2 (df = 1) = 18.918 ($p < 0.001$)]. The odds ratio suggests that respondents were 2.1 times more likely to state that they contributed to burning fossil fuels for energy after taking part in the intervention. Given the low percentage in the pre-communication survey, this particular statistic was identified by the ET campaign team as an important point for consideration in the campaign strategy, because the percentage of Nottinghamshire and Derbyshire residents agreeing that they were responsible for this was close to half the percentage nationally. It was recommended that the target audience for the ET project might need further education about energy generation issues and these results suggest that this knowledge has increased over the campaign period.

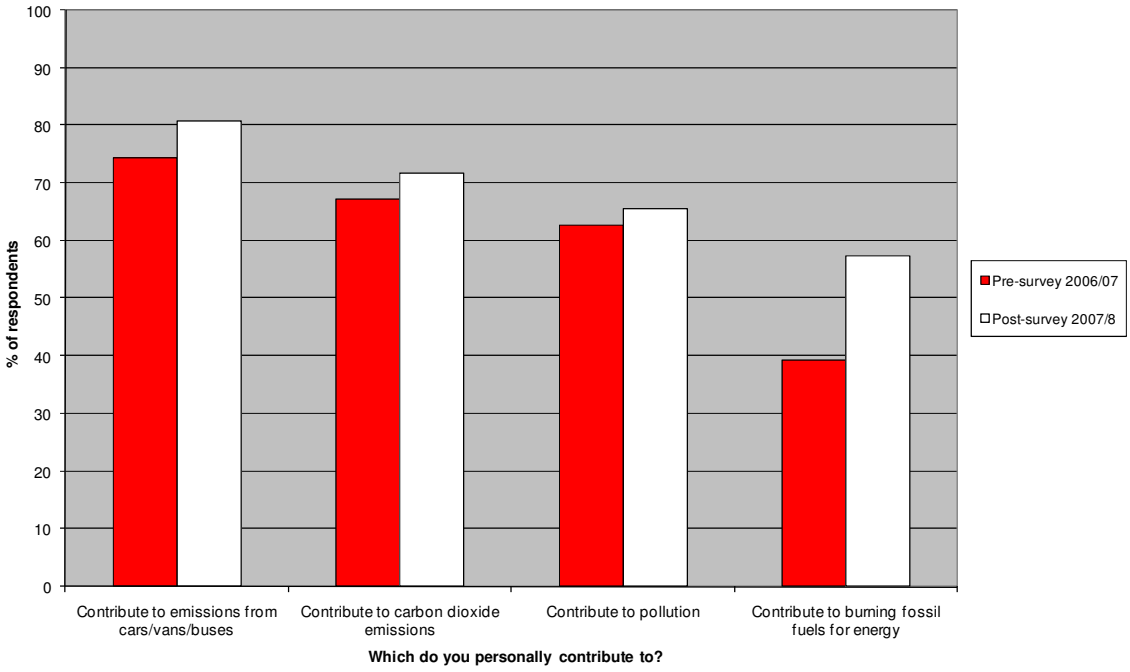


Figure 5.1: Percentage of respondents stating that they personally contribute to activities that cause climate change.

Survey respondents were asked how concerned they were about the impact of climate change in the UK. At 29.5%, a greater percentage of Nottinghamshire & Derbyshire residents were 'very concerned' after the intervention, compared to 27% before, but the difference was not statistically

significant. On the other hand, the percentage of people who were not at all concerned about the impact of climate change increased from 2.4% to 5.2%. In order to provide an additional measure of concern than simply the descriptive information presented above, 'average concern' was measured by giving each answer a different number of points. One point was given for 'not at all concerned', two points for 'not very concerned', three points for 'fairly concerned' and four points for 'very concerned'. The results show a very similar level of concern in both surveys with the following average scores: pre-communication average = 3.07; post-communication average = 3.05. These results suggest that concern changed little pre- and post-intervention, with average scores being within 1% of each other before and after the campaign.

Respondents were given four pairs of words that could be used to describe their attitude towards climate change and asked which word best reflected their opinion. The results for each pair of words are plotted in the bar graphs in figure 5.2. A greater percentage of the sample was hopeful (as opposed to fearful) and positive (as opposed to negative) post-communication. Conversely, there was a decrease in the percentage of people who were motivated (as opposed to unmotivated) and enthused (as opposed to frustrated) during the campaign period. A second statistically significant difference amongst the survey data was discovered in relation to the latter semantic differential. Chi-square test showed that it was significantly more likely that respondents answered 'frustrated' in the post-communication survey [X^2 (df = 1) = 9.887 (p = 0.002)]. The odds ratio suggests that respondents were 1.7 times more likely to choose this option after taking part in the intervention. The overall percentage of positive and negative options was ascertained by combining the results from each individual question. This showed that residents of the two counties were more likely to choose the more positive option pre-communication (65.4%) than post-communication (61.6%).

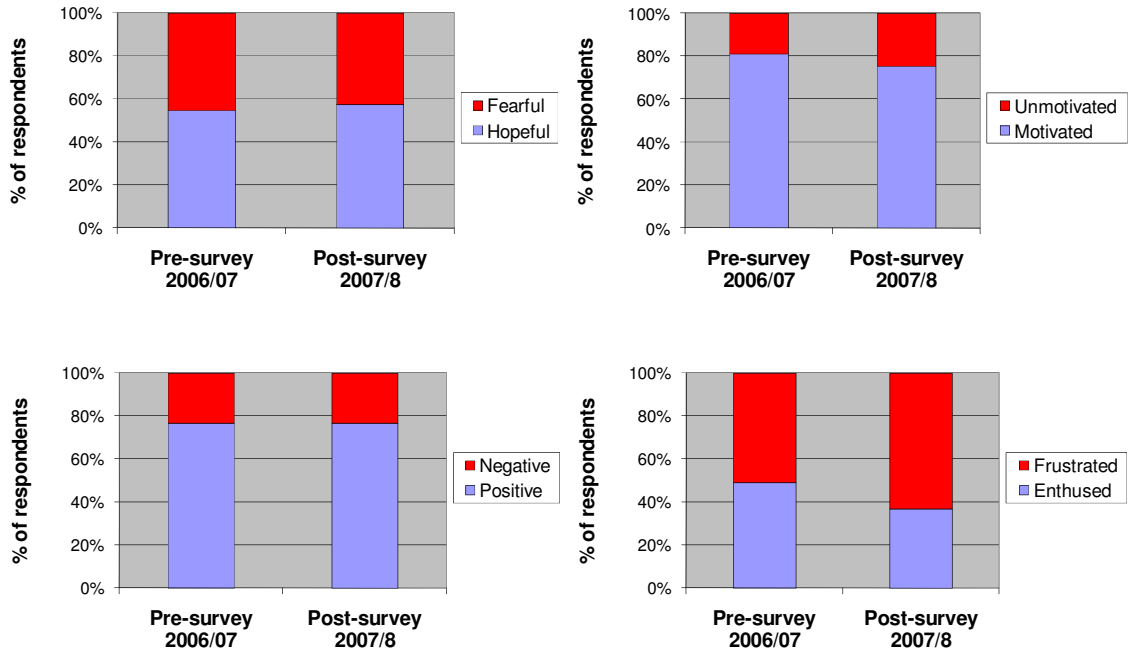


Figure 5.2: Percentage of respondents choosing which word from several pairs of semantic differentials best describes their attitude to climate change.

Respondents were asked to what extent they felt different groups could influence climate change and were given the following response options: 1 = 'no influence'; 2 = 'a little influence'; 3 = 'some influence'; and 4 = 'a large influence'. Their response gives a measure of their self-efficacy in relation to climate change, which is the extent to which people believe they as individuals can have an impact on the issue. It also gives an idea of how important people think they are as individuals, compared to other groups. The surveys asked people to state the extent to which they felt the UK government, industry and businesses, themselves personally and their local community could have an impact on climate change. Several interesting findings were discovered from the before-after comparison. Statistically significant differences were discovered in relation to personal influence and the influence of industry and businesses.

On average, post-communication survey respondents were significantly more likely [$t = 3.59$, $df = 555$, p (1-tailed) < 0.0005] to state that they could have less influence on climate change ($\underline{M} = 2.18$, $\underline{SE} = 0.04$) than pre-communication survey respondents ($\underline{M} = 2.42$, $\underline{SE} = 0.05$). The effect size ($r = 0.15$) suggests that this was a relatively small effect. The histograms representing the frequency distribution of respondents' answers showed a relatively normal distribution, but the K-S tests

indicated that the data were not normally distributed: pre-survey (D = 0.298, df = 278, p < 0.0005); and post-survey (D = 0.313, df = 323, p < 0.0005). However, the sample sizes were both relatively large, and the K-S test may overemphasise deviations from normality in such cases. Given the highly significant K-S tests, the equivalent non-parametric test (the Mann-Whitney test) was run [Z = -3.298, p (1-tailed) = 0.005], which confirmed that there was a significant difference between the two samples.

On the other hand, post-communication survey respondents were significantly more likely [t = -4.97, df = 585, p (1-tailed) < 0.0005] to state that their local community could have more influence on climate change (M = 2.51, SE = 0.05) than pre-communication survey respondents (M = 2.19, SE = 0.05). Furthermore, the effect size (r = 0.20) was greater than that reported above and suggested a small to medium effect. Again, the histograms showed a relatively normal distribution, but the K-S tests suggested non-normal data: pre-survey (D = 0.326, df = 282, p < 0.0005); and post-survey (D = 0.269, df = 306, p < 0.0005). In light of the results of the K-S tests, the Mann-Whitney test was run [Z = -3.298, p (1-tailed) = 0.0005], confirming the statistically significant result.

In relation to the statistics reported above, the percentage of N&D residents who thought that their local community could have either 'some' or 'a large' impact increased from 27% to 46.6%, whereas the number who thought that they personally could have 'some' or 'a large' impact reduced from 38.9% to 28.1%. Pre-campaign, the percentage results suggested that Nottinghamshire and Derbyshire residents thought their local community could have a small impact. The ET campaign was designed to get people thinking about climate change in terms of their local community, emphasising that people within the two counties of Nottinghamshire and Derbyshire can work together and pledge to take action. Results from the post-campaign survey suggest that residents of the two counties believe that their local community can have more of an influence on climate change than they can as individuals Therefore, this comparison appears to represent the success of the campaign in bringing action to a local level.

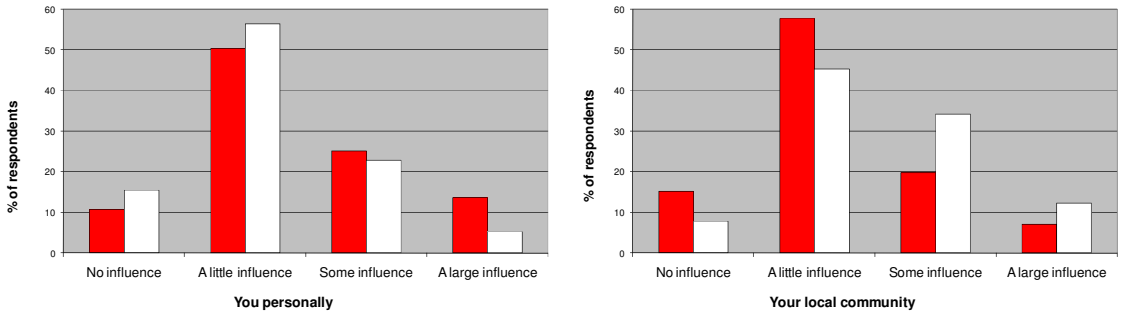


Figure 5.3: Percentage of respondents and the extent to which they feel that they personally and their local community can have an influence on climate change

Respondents were asked who they had heard talking about climate change to see which information channels were most frequently cited. As figure 5.4 shows, the two sources through which most people had heard about climate change were 'government or politicians' and 'friends/family'. The percentage of people stating they had heard each source talk about climate change actually reduced for five out of the eight considered in the questionnaire. Two sources were cited more frequently and one (the respondents' local authority) remained exactly the same.

Three of these results were identified by chi-square tests as statistically significant. It was significantly more likely that respondents stated that they had heard government or politicians talking about climate change before taking part in the communications campaign [X^2 (df = 1) = 6.771 (p = 0.009)]. The odds ratio suggests that respondents were 1.8 times more likely to state that they had heard government or politicians talking about CC before taking part in the intervention. It was also significantly more likely that those surveyed mentioned that they had heard friends/family talking about climate change pre-communication [X^2 (df = 1) = 4.156 (p = 0.041), odds ratio = 1.4]. Conversely, it was significantly more likely that respondents stated that they had heard colleagues at work talking about climate change being subjected to ET communications [X^2 (df = 1) = 4.017 (p = 0.045), odds ratio = 1.5]. These results are mixed, but they do suggest that the residents of the two counties access climate change information from a wide range of groups.

At this point in the survey there was also an open-ended question that asked respondents where they had seen or heard anything about climate change recently and was designed to see which media were cited as sources of CC information. 120 out of 307 respondents gave an answer to this question in the pre-communication survey and 130 out of 347 responded in the post-survey. There were several major categories of responses: television (78 respondents in the pre-survey, 89 in the post-survey); newspapers (40 respondents in the pre-survey, 48 in the post-survey); and radio (18

respondents in the pre-survey, 21 in the post-survey). It is therefore evident that people in Nottinghamshire and Derbyshire receive much of their climate change information through the mass media.

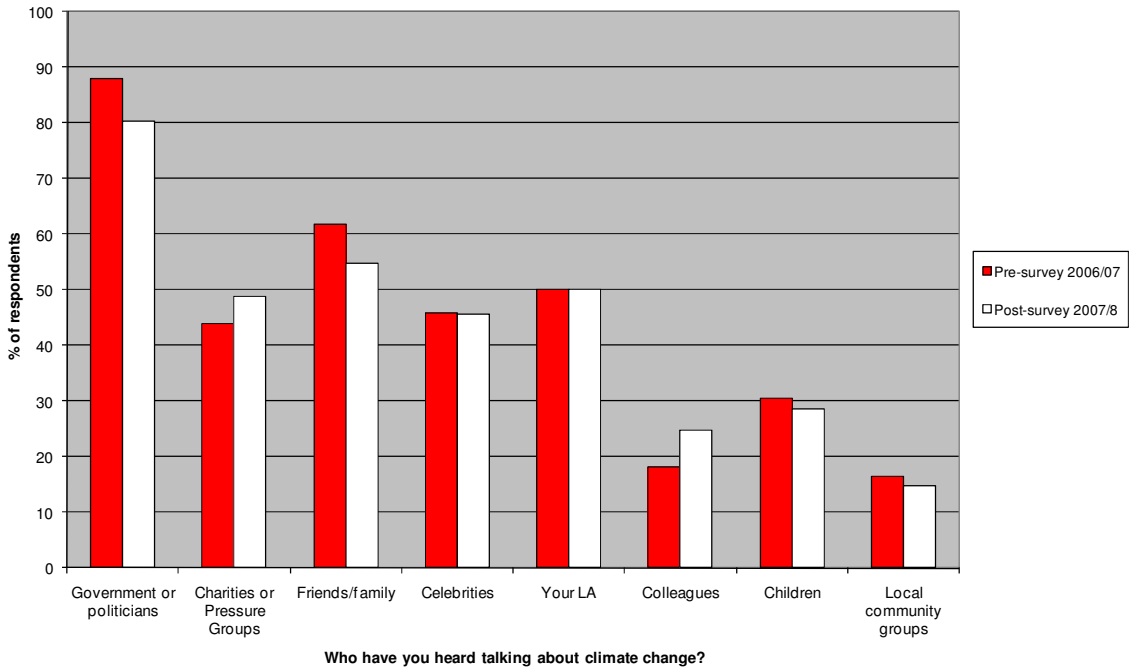


Figure 5.4: Percentage of respondents stating whether they had heard about climate change through a number of sources.

The surveys asked people how often they talked about climate change with their family and friends to measure whether it was a subject that was commonly discussed in everyday life [1 = 'never'; 2 = 'every 6 months'; 3 = 'monthly'; 4 = 'fortnightly'; 5 = 'weekly'; and 6 = 'daily']. Figure 5.5 displays the difference between N&D residents before and after the ET campaign. The independent samples t-test [t = 2.35, df = 643, *p* (1-tailed) = 0.02] confirmed that respondents were significantly likely to talk about climate change more often pre-communication (M = 3.08, SE = 0.09) than post-communication (M = 2.79, SE = 0.08). The effect size (r = 0.09) suggests that this was a small effect. Both the frequency distributions and the K-S tests [pre-survey (*D* = 0.166, df = 305, *p* < 0.0005); and post-survey (*D* = 0.164, df = 340, *p* < 0.0005)] indicated that the data were not normally distributed, so again the Mann-Whitney test was run. The results of this analysis [*Z* = -3.298, *p* (1-tailed) = 0.0005] supported the conclusion that people talked about climate change more often pre-communication.

In terms of descriptive statistics, the percentage of N&D residents discussing climate change at least once every month before the ET campaign was 59.6% compared to 53.2% afterwards. Therefore, the percentage discussing climate change reduced over the campaign period, but it is still relatively high when compared to the UK baseline. Word of mouth is a very important communication channel for a community-based project with a large target audience, such as ET. As such the significant reduction in the regularity with which the target audience talked about climate change suggests a negative impact from the campaign.

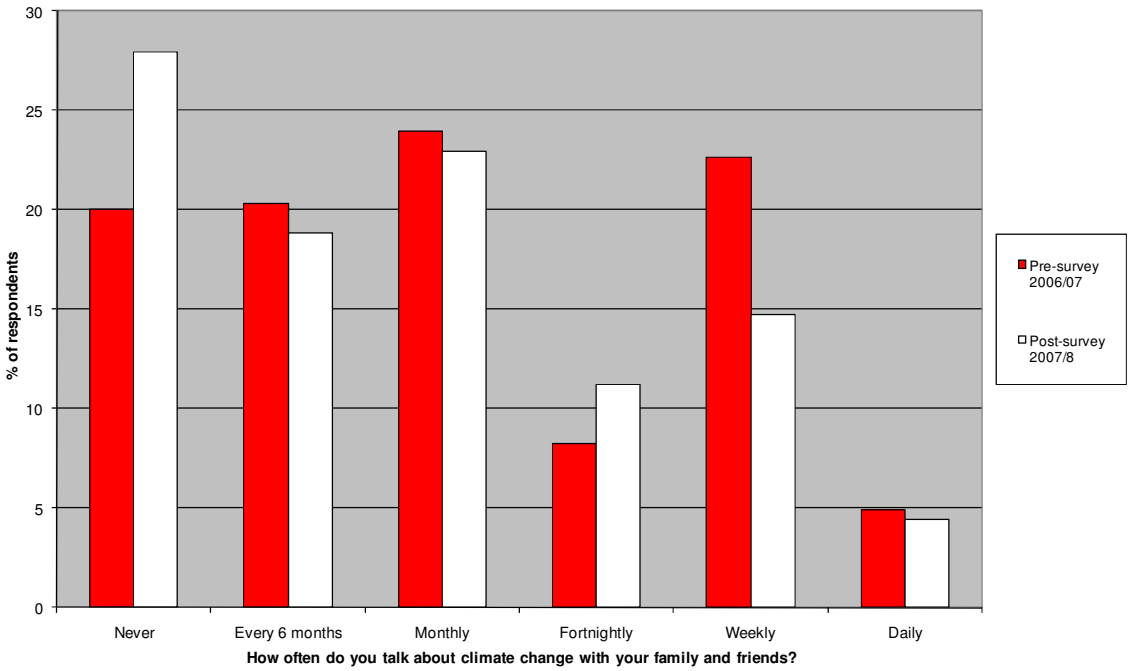


Figure 5.5: Percentage of respondents and the regularity with which they talk about climate change with their family & friends

5.1.2.2 Everybody's talking about climate change conclusions

The results before and after communications were mixed in relation to the ET campaign as some of the perceptions measured had become more positive and some had become less positive. Awareness of three climate change-related terms increased (however, there was also a decrease in relation to three other terms), as did knowledge of the contribution of individuals to carbon dioxide emissions from various different sources. Importantly, given that the key aim of the UKCCCI was to make perceptions more positive, the results suggest that a greater percentage of people would state that they are positive (as opposed to negative) and hopeful (instead of fearful) after the intervention. Conversely – which illustrates very well the mixed nature of the results – less people

were enthused (as opposed to frustrated) and motivated (rather than unmotivated). Furthermore, a key aim of the ET campaign specifically was to point out to people that they can work together as a community to reduce their impact on the climate and the statistically significant survey results – where the percentage of people saying that their local community could have some or a large influence on climate change increased from 27% to 46.6% – suggest that this was a particular success. However, another important aim of the UKCCCI was to increase the extent to which individuals felt that they personally could have an influence on climate change, but this statistic reduced significantly over the course of the project. There was also a reduction in the extent to which respondents were concerned about the impacts of climate change and the extent to which respondents thought humans were responsible for causing climate change. Finally there was also a lessening in the extent to which respondents believed that the climate was actually changing and respondents tended to talk about climate change significantly less often. The results showed that residents of Nottinghamshire and Derbyshire access information about climate change from a number of different sources; again, changes between survey results pre- and post-communication were mixed with some sources of information being accessed more and some being accessed less.

5.1.3 Comparing pre- and post-communication perceptions for 'Wellingborough Toolkit'

5.1.3.1 Survey results and analysis

Respondents were asked whether they had heard of a number of terms relating to the environment. For five out of the six terms asked in the questionnaire, all Toolkit respondents (100%) answered 'yes' before and after they engaged with the project and for the sixth term (climate change gases) the percentage increased post-communication. These results suggest that there was a general awareness of climate change amongst the Toolkit target audience and they were already aware of the issues before taking part in the communications.

Respondents were also asked to what extent they agreed that the world's climate is changing [1 = 'agree strongly'; 2 = 'agree slightly'; 3 = 'disagree slightly'; and 4 = 'disagree strongly']. An independent samples t-test [t = -1.77, df = 75, p (1-tailed) = 0.04, r = 0.20 (small to medium effect)] suggested a statistically significant difference with respondents to the pre-communication survey (M = 1.21, SE = 0.05) more likely to agree to a greater extent that the world's climate was changing than respondents to the post-communication survey (M = 1.36, SE = 0.07). Frequency distributions and K-S tests [pre-survey (D = 0.485, df = 85, $p < 0.0005$); and post-survey (D = 0.409, df = 44, $p < 0.0005$)] suggested that the data were not normally distributed, so the Mann-Whitney test was run, as per the analyses in section 5.1.2.1. The results of this analysis [Z = -1.849, p (1-tailed) = 0.032] also indicated a statistically significant result. Even though respondents tended to agree to a lesser extent that climate change was happening after they had engaged with the Toolkit, not a single

respondent disagreed that it was happening (as can be seen in figure 5.6, 100% of people in both the pre- and post-intervention surveys agree slightly or strongly that the climate is changing).

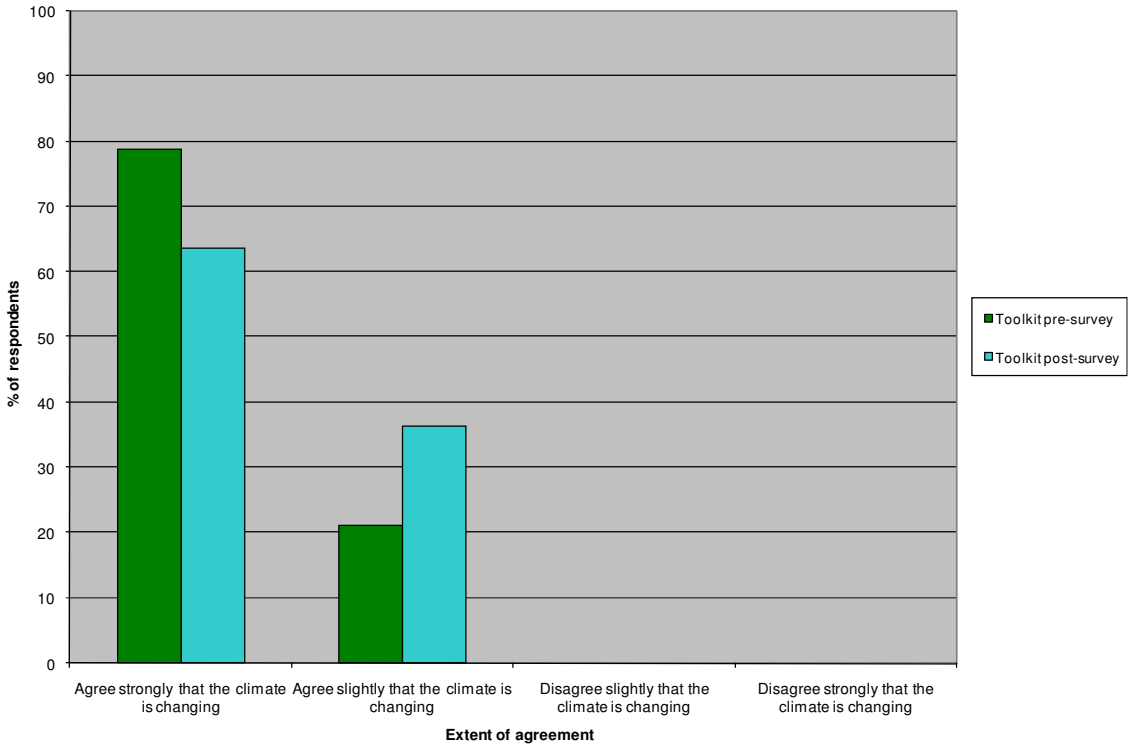


Figure 5.6: The extent to which respondents agreed or disagreed that the world's climate is changing

The survey asked how concerned respondents are about the impact of climate change in the UK [1 = 'very concerned'; 2 = 'fairly concerned'; 3 = 'not very concerned'; and 4 = 'not at all concerned']. On average, respondents to the pre-communication survey (M = 1.65, SE = 0.07) were more likely to be concerned [t = -2.15, df = 129, *p* (1-tailed) = 0.02, r = 0.19 – small to medium effect] than respondents to the post-communication survey (M = 1.91, SE = 0.10). As with several of the t-tests reported previously, both the frequency distributions and the K-S tests [pre-survey (*D* = 0.286, df = 85, $p < 0.0005$); and post-survey (*D* = 0.291, df = 46, $p < 0.0005$)] indicated that the data were not normally distributed and a Mann-Whitney test was run to confirm the result. Mann-Whitney test results [*Z* = -2.291, *p* (1-tailed) = 0.011] supported the conclusion that people were significantly more concerned about climate change pre-communication.

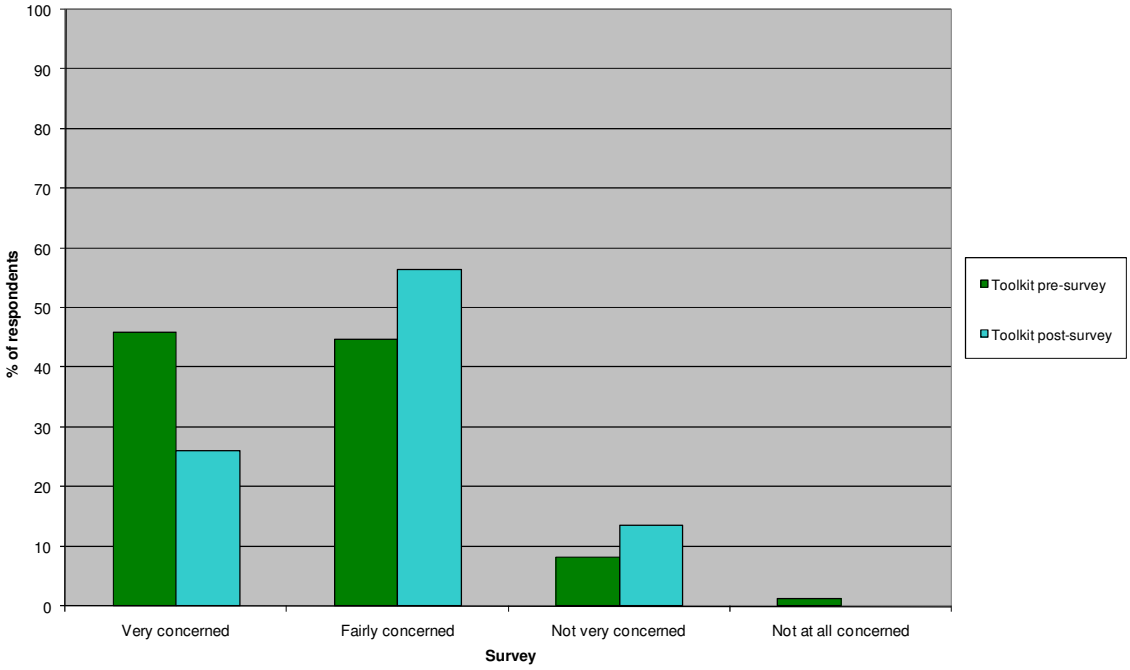


Figure 5.7: The extent to which respondents were concerned about climate change

Respondents were given four pairs of words (semantic differentials) that could be used to describe their attitude towards climate change and asked which word best reflected their opinion, and the results for each pair of words are plotted in the bar graphs in figure 5.8. A greater percentage of the sample was hopeful (as opposed to fearful) and enthused (as opposed to frustrated) post-communication. However, there was a decrease in the percentage of people who were motivated (as opposed to unmotivated) and positive (as opposed to negative) during the project period. Only one of these results was statistically significant, as shown by the results of a chi-square test: it was significantly more likely that respondents answered 'hopeful' after being subjected to the communications [X^2 (df = 1) = 5.026 (p = 0.025), odds ratio = 2.3].

The overall percentage of positive and negative options was ascertained by combining the results from each individual question. This showed that the individuals who engaged with the Toolkit were less likely to choose the more positive option after engaging with the project (52.4% in the 'before' survey and 58.7% in the 'after' survey). These results compared favourably with the wider UK population which chose the more positive option 50.2% of the time (COI, 2006).

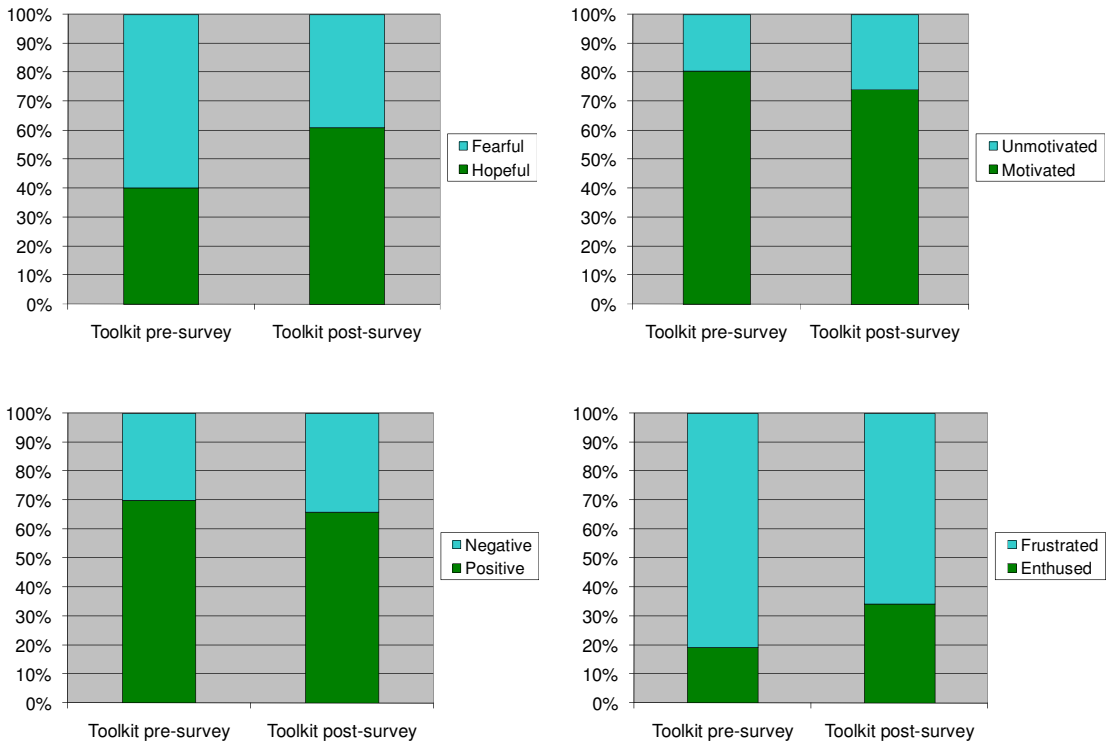


Figure 5.8: Percentage of respondents choosing which of a pair of words best reflects their opinion about climate change.

Respondents were asked who they had heard talking about climate change to see which information channels were most frequently cited. The results showed that the percentage of people hearing about climate change from seven out of the eight sources was greater after engagement with the Wellingborough Toolkit (the only source that decreased percentage-wise was 'government or politicians'). Given that WT was implemented by the Borough Council of Wellingborough, it was particularly interesting that the percentage of survey respondents who had heard their local authority communicate on this issue had increased (80.5% in the pre-communication survey compared 84.8% in the post-communication survey). This suggests that Wellingborough residents and BCW staff access climate change information from a wide variety of sources and that one of the most important sources is the council itself. Therefore BCW would be very well-placed to carry out any future climate change communication initiatives.

Two of the six items on the climate change worldview scale (see section 3.3.2 for information about this scale and section 5.2.3 for the full scale analysis) provided statistically significant results between pre- and post-communication surveys. Both the significant results were negative in terms

of promoting positive perceptions of climate change. When asked the extent to which they agreed with a number of statements [response options: 1 = 'strongly disagree'; 2 = 'disagree'; 3 = 'neither agree nor disagree'; 4 = 'agree'; and 5 = 'strongly agree'], respondents were significantly more likely to agree [t-test: t = 2.12, df = 130, *p* (2-tailed) = 0.04, Mann-Whitney test: *Z* = -2.634, *p* (1-tailed) = 0.004] that humans are seriously abusing the Earth's atmosphere before receiving communication [M = 4.24, SE = 0.10, K-S test: *D* = 0.282, df = 86, $p < 0.0005$] than afterwards [M = 3.87, SE = 0.14, K-S test: *D* = 0.379, df = 46 $p < 0.0005$]. The effect size (r = 0.18) suggests that this was a small to medium effect. Furthermore respondents were significantly more likely to agree [t-test: t = -2.66, df = 115, *p* (2-tailed) = 0.009, Mann-Whitney test: *Z* = -2.829, *p* (1-tailed) = 0.003] that the possible consequences of climate change have been greatly exaggerated in the post-communication survey [M = 2.63, SE = 0.15, K-S test: *D* = 0.207, df = 41 $p < 0.0005$] than prior to receiving communications [M = 2.11, SE = 0.12, K-S test: *D* = 0.263, df = 76, $p < 0.0005$]. Again, this was a small to medium effect (r = 0.24).

5.1.3.2 Wellingborough Toolkit conclusions

As with the overall results from surveys before and after the ET campaign, results were mixed in relation to the Wellingborough Toolkit. Compared to the wider UK population, there was a greater awareness of climate change terms with 100% of respondents aware of five out of the six terms both before and after intervention. Post-intervention, a greater percentage of respondents accessed climate change information from a number of different sources. In relation to the four semantic differentials, the more positive option was chosen to a greater extent post-intervention for two pairs of words, but the more negative option was chosen in relation to the other two pairs. The extent to which respondents believed that the climate was actually changing was lower in the post-intervention survey. In terms of statistically significant differences between the pre- and post-intervention samples, perceptions were generally less positive after respondents had taken part in the communications.

5.1.4 Comparing pre- and post-communication perceptions for 'C-Change'

5.1.4.1 Survey results and analysis

Respondents were significantly more likely to have heard of all the terms in the questionnaire after taking part in the C-Change project. Table 5.1 shows the results of chi-square tests and the percentage of respondents that were aware of each of the six terms. These results suggest that the communications carried out by C-Change helped to raise awareness of a range of climate-related terms.

Term	Results	X^2 (df = 1)	Significance
Global warming	97.4% were aware pre-communication compared to 100% post-communication	4.258	$p = 0.039$
Climate change	96.1% were aware pre-communication compared to 100% post-communication	6.575	$p = 0.01$
Carbon dioxide	94.8% were aware pre-communication compared to 100% post-communication	8.836	$p = 0.003$
Carbon emissions	Odds ratio = 6.7	17.987	$p < 0.0005$
Climate change gases	Odds ratio = 4.1	14.636	$p < 0.0005$
The greenhouse effect	Odds ratio = 8.3	12.287	$p < 0.0005$

Table 5.1: Significant differences between pre- and post-C-Change survey respondents in terms of their awareness of phrases relating to the environment

When asked to what extent they agreed that the world's climate is changing (agree strongly = 1, agree slightly = 2, disagree slightly = 3 or disagree strongly = 4), there was a significant difference between the pre- and post-intervention samples. On average, respondents to the post-communication survey (M = 1.22, SE = 0.04) were more likely to agree that the world's climate was changing [t-test: t = 1.98, df = 250, p (1-tailed) = 0.02, K-S tests: pre-survey ($D = 0.444$, df = 865, $p < 0.0005$), post-survey ($D = 0.484$, df =164, $p < 0.0005$), Mann-Whitney test: $Z = -1.727$, p (1-tailed) = 0.042] than respondents to the pre-communication survey (M = 1.30, SE = 0.02). The effect size (r = 0.12) suggests that this was a small effect.

The descriptive statistics (see figure 5.9) also point to a positive change in perceptions. Generally, there was consensus that climate change is happening, with very few people disagreeing before or after engaging with C-Change. After engagement with C-Change, a greater percentage of under-18 year olds agreed strongly (from 65.3% to 73.5%) and not a single respondent disagreed strongly that the climate was changing. The net percentage agreeing (i.e. all those that either agreed strongly or slightly) remained almost exactly the same (at 97.1% and 97.2% in the pre- and post-surveys, respectively), suggesting that some respondents, who were only slightly convinced about the existence of climate change, were more convinced post-intervention. Results from the over-18 pre- and post-survey also show a positive increase, as those people who engaged with C-Change were more likely to agree that climate change exists. Once again, the net percentage of agreement

was quite similar (98% in the pre-survey and 98.9% in the post-survey), but there was a slight decrease in the percentage of people agreeing strongly, from 86% to 84.8%.

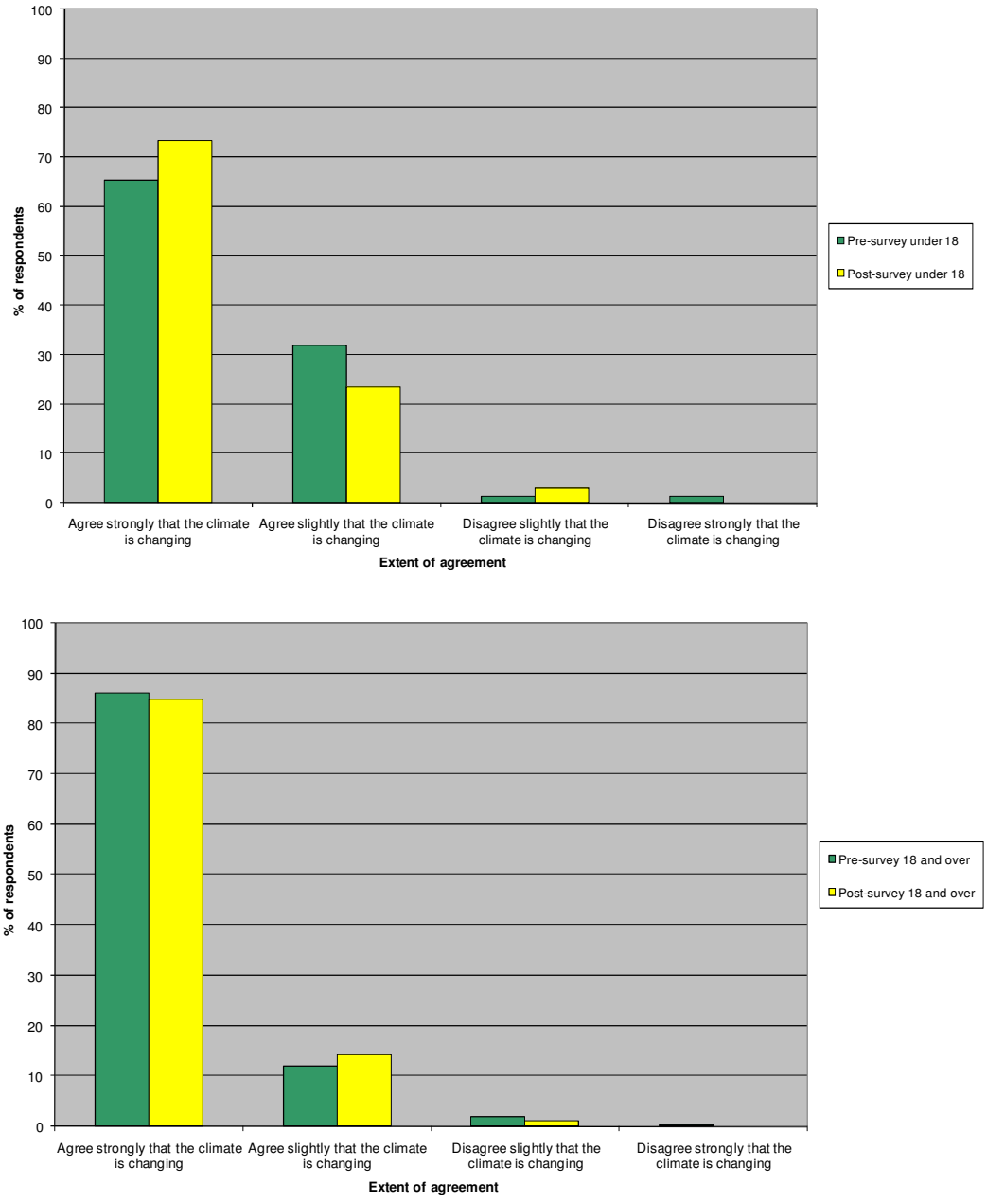


Figure 5.9: Percentage of respondents displaying different levels of agreement that the climate is changing (top graph shows the results for under-18 year olds; bottom graph shows the results for those aged over-18).

The extent to which under-18 year olds thought that climate change was to some extent (entirely or mainly) due to human behaviour decreased in the post-communication survey from 85% to 75.4% and the percentage of individuals who thought that natural changes (entirely or mainly) were responsible rose from 15.1% to 24.6%. The results were similar for the 18 and over age group, although not quite to such an extent. The net percentage of respondents blaming human action mainly or entirely for climate change decreased from 91% to 89.8%, although a smaller proportion of the sample blamed natural changes entirely. The difference between the before and after samples was not found to be statistically significant.

Respondents were asked how concerned they were about the impact of climate change in the UK [1 = 'very concerned'; 2 = 'fairly concerned'; 3 = 'not very concerned'; and 4 = 'not at all concerned'] and the results are shown in the two graphs in figure 5.10. On average, respondents to the post-communication survey ($\underline{M}$ = 1.54, $\underline{SE}$ = 0.05) were significantly more likely to be concerned about the impact of climate change in the UK [t-test: t = 2.93, df = 1021, p (1-tailed) = 0.002, K-S tests: pre-survey (D = 0.267, df = 867, $p < 0.0005$), post-survey (D = 0.327, df = 156, $p < 0.0005$), Mann-Whitney test: Z = -2.980, p (1-tailed) = 0.002] than respondents to the pre-communication survey ($\underline{M}$ = 1.72, $\underline{SE}$ = 0.02). The effect size (r = 0.09) suggests that this was a small effect.

With regard to the under-18 age group, there was a percentage increase in the number of respondents who were very concerned (from 30.7% to 38.5%) and the number who were either very or fairly concerned (from 89.2% to 90.8%). A similar result was also noted in the 18 and over age group, where the percentage of respondents who were very concerned rose from 52% to 61.5% and the number who were either very or fairly concerned rose from 93.3% to 96.7%. In order to provide a further measure of concern, 'average concern' was measured by giving each answer a different number of points: one for 'not at all concerned'; two for 'not very concerned'; three for 'fairly concerned'; and four for 'very concerned'. The results for each age group are in table 5.2, below, which confirm the results of the statistical analysis and show that concern has increased amongst the target audience over the project period.

Survey	'Average concern'
Under-18 pre-communication survey	3.17
Under-18 post-communication survey	3.28
18 and over pre-communication survey	3.44
18 and over post-communication survey	3.58

Table 5.2: 'Average concern' for the C-Change pre- and post-intervention surveys.

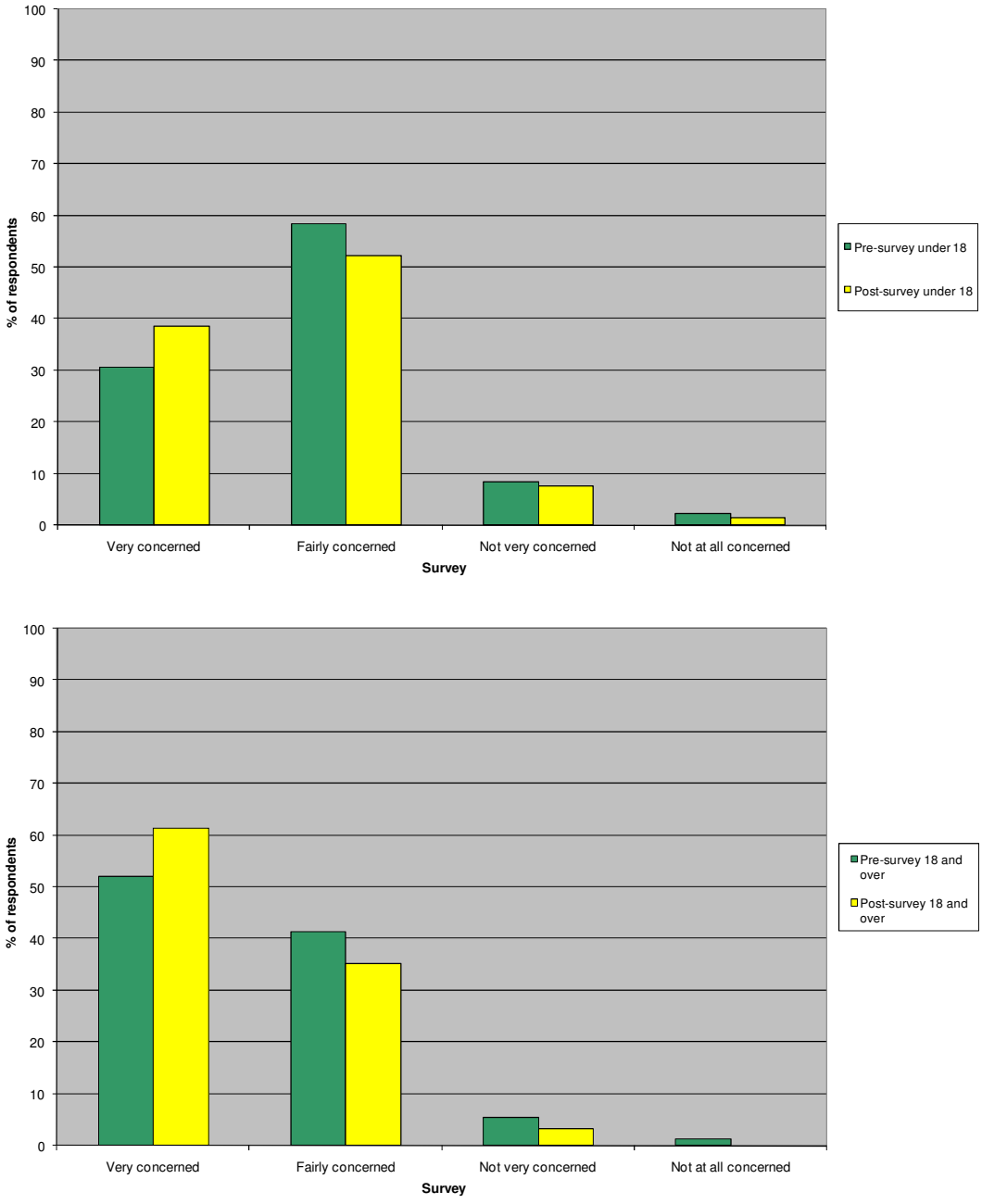


Figure 5.10: Percentage of respondents and the extent to which they are concerned about climate change (top graph shows the results for under-18 year olds; bottom graph shows the results for those aged over-18).

Respondents were given four pairs that could be used to describe their attitude towards climate change and asked which word best reflected their opinion and the results are shown in figure 5.11. In three out of the four categories (hopeful or fearful, positive or negative and frustrated or enthused), for both the 'under-18' and '18 and over' age groups, the percentage of people choosing the more positive of the two options decreased. However, the percentage increased in both age groups in relation to the number of people who were motivated as opposed to unmotivated. Two of these differences were statistically significant. It was significantly more likely that respondents answered fearful as opposed to hopeful after taking part in the communications [X^2 (df = 1) = 8.104 (p = 0.004), odds ratio = 1.7]. It was also significantly more likely that respondents answered frustrated as opposed to enthused post-intervention [X^2 (df = 1) = 7.194 (p = 0.007), odds ratio = 1.7].

The total percentage of positive options ('hopeful', 'motivated', 'positive' and 'enthused) chosen was compared to the total percentage of negative options ('fearful', unmotivated'', 'negative' and 'frustrated') chosen by combining the results from each individual question. This showed that, even though three out of the four pairs of words showed a net reduction in the percentage of people choosing the more positive option, the overall percentages were roughly equal for the 18 and over group at 52.7% in both surveys. However, the result was different for the under 18 age group, where there was a reduction in the percentage of respondents choosing the more positive word, from 59.2% to 49.6%

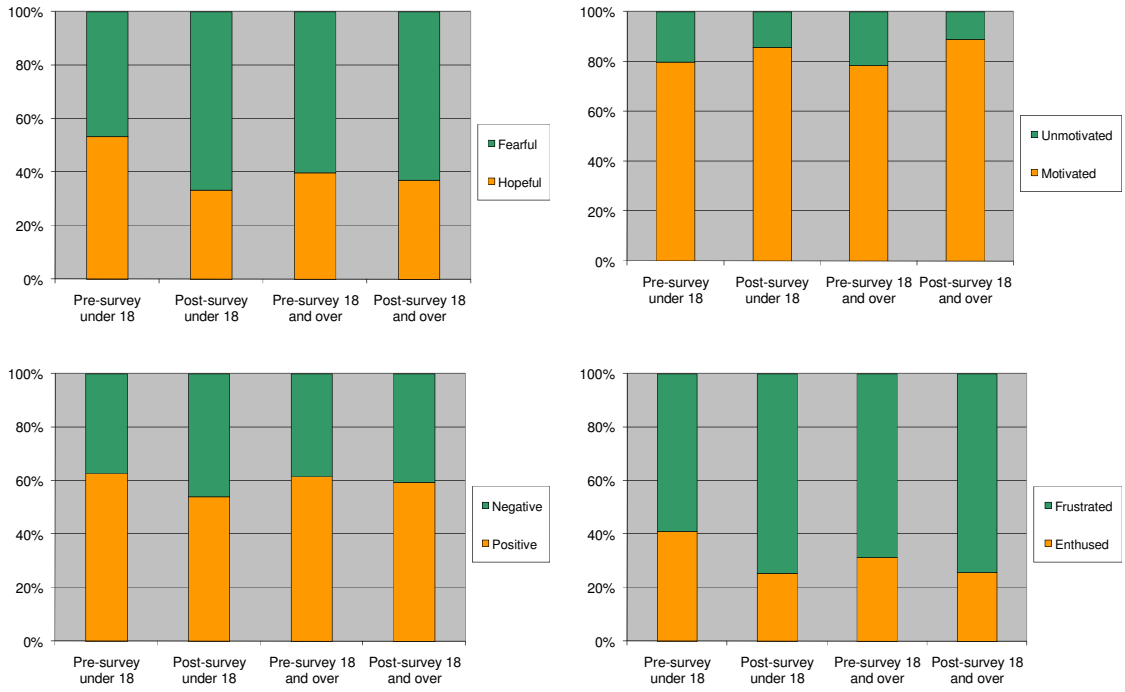


Figure 5.11: Percentage of respondents choosing which of a pair of semantic differentials best reflects their opinion about climate change.

Respondents were also asked to what extent [1 = 'no influence'; 2 = 'a little influence'; 3 = 'some influence'; and 4 = 'a large influence'] they felt different groups of people could influence climate change: the UK government; industry and businesses; their local community; and themselves personally. Their response gives a measure of who they believe can have the most impact on climate change and how different levels of society can impact on the problem. There were two significant differences identified from this survey question. On average, post-communication survey respondents (M = 3.52, SE = 0.06) were significantly more likely [t = -2.67, df = 271, p (1-tailed) = 0.004, K-S tests: pre-survey (D = 0.358, df = 840, $p < 0.0005$) and post-survey (D = 0.391, df =162, $p < 0.0005$), Mann-Whitney test: Z = -1.698, p (1-tailed) = 0.045, r = 0.16 – small effect] to state that the UK government could have more influence on climate change than pre-communication survey respondents (M = 3.35, SE = 0.03). Post-communication survey respondents (M = 3.72, SE = 0.05) were also significantly more likely [t = -4.89, df = 304, p (1-tailed) < 0.0005, K-S tests: pre-survey (D = 0.386, df = 830, $p < 0.0005$); and post-survey (D = 0.472, df =162, $p < 0.0005$), Mann-Whitney test: Z = -3.929, p (1-tailed) < 0.0005, r = 0.27 – medium effect] to state that industry and businesses could have more influence on climate change than pre-communication survey respondents (M = 3.43, SE = 0.03).

In relation to the under 18 age group, the percentage of people suggesting that all four groups ('the UK government', 'industry and businesses', 'you personally' and 'your local community') can have no influence has reduced over the course of the project. Furthermore, the percentage of people who thought that the government and industry and businesses could have a large influence increased. On the other hand, there was a reduction in the percentage of respondents who thought that they themselves and their local community could have a large influence on limiting climate change. In both the pre- and post-surveys, the under-18 year olds sampled by C-Change considered industry and businesses to be the most important player in terms of influence on climate change mitigation. Almost the exact same patterns that were evident for the under-18 age group are also evident for the 18 and over age group: the percentage of people stating that they can have no influence has decreased for all four groups considered in the questionnaires ('the UK government', 'industry and businesses', 'you personally' and 'your local community'),; the percentage of people who thought that industry and businesses could have a large influence has increased; the percentage of people who thought that they themselves and their local community could have a large influence has decreased; and pre- and post-communication results show that those aged 18 and over sampled by C-Change think that industry and businesses are in the best position to have an impact. The only difference is that the fraction of respondents who thought the UK government could have a large influence has decreased, compared to the increased for the under-18 samples.

These results suggest that more people appear to realise that everyone can have some influence on climate change (i.e. that none of the groups can have 'no influence'). However, even though respondents are most likely correct in stating that the UK government and industry and businesses can potentially have more influential than local communities or individuals, it is slightly concerning that the percentage of people thinking that they personally can have a large influence on climate change has decreased over the project period.

Respondents were asked who they had heard talking about climate change to discover what methods people used to access climate change information; eight different sources were considered in the questionnaire. There were statistically significant differences between the before and after samples for six out of these eight sources, with all differences showing a positive increase. Table 5.3 shows the results of the significant chi-square tests.

Source of information	Results	X^2 (df = 1)	Significance
Government or politicians	Odds ratio = 1.8 times more likely to answer 'yes' post-communication	6.903	$p = 0.009$
Charities or pressure groups	Odds ratio = 2.4 times more likely to answer 'yes' post-communication	19.257	$p < 0.0005$
Friends/family	Odds ratio = 2.8 times more likely to answer 'yes' post-communication	20.273	$p < 0.0005$
Your local authority	Odds ratio = 1.7 times more likely to answer 'yes' post-communication	8.796	$p = 0.003$
Children	Odds ratio = 1.8 times more likely to answer 'yes' post-communication	11.095	$p = 0.001$
Local community groups	Odds ratio = 1.7 times more likely to answer 'yes' post-communication	8.471	$p = 0.004$

Table 5.3: Significant differences between pre- and post-C-Change survey respondents in terms of the sources of information they receive climate change information from.

Figure 5.12 shows the percentage of respondents stating which sources they had received climate-related information from. It is evident that, under 18 post-communication respondents were more likely to receive CC-information from all the channels considered (apart from celebrities which remained approximately the same). The percentage of respondents who had heard about climate change from charities and pressure groups had increased from 51.9% to 74.3%, which was not surprising given that the C-Change project was run by the Woodcraft Folk youth charity. In relation to the 18 and over age group, six out of the eight sources were cited more frequently as places where individuals had heard about climate change post-intervention. Again, there was an increase in the percentage of those who had heard charities and pressure groups talk about climate change (from 75.9% to 82.8%). Also, as the C-Change communicators were young people, another important result was the increase in the number of people who had heard children talk about climate change (from 26.2% to 40.9%). These results suggest that the people sampled by C-Change are more aware of the sources of information about climate change after engaging with the project.

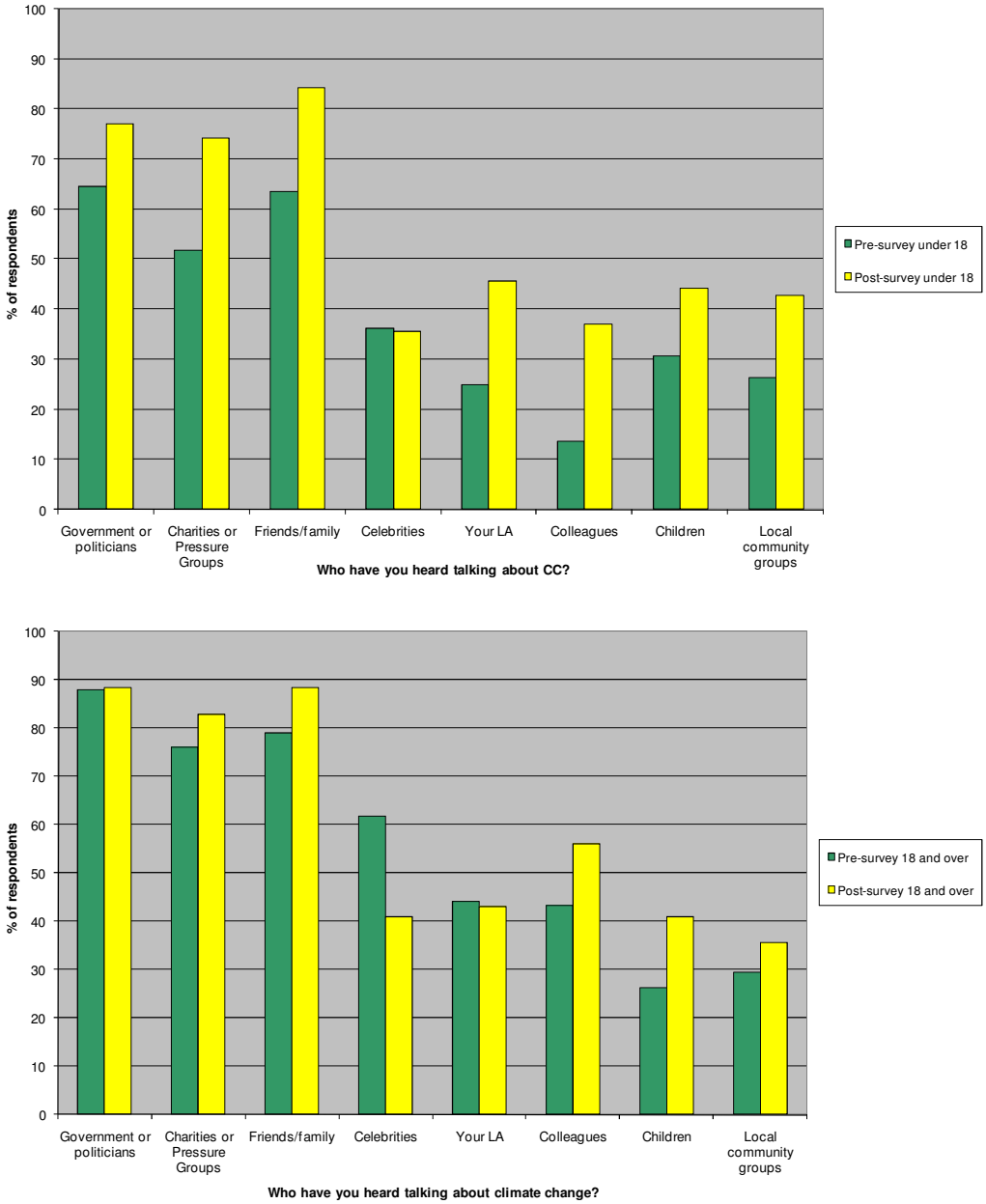


Figure 5.12: Percentage of respondents stating whether they had heard about climate change through a number of sources (top graph shows the results for under-18 year olds; bottom graph shows the results for those aged over-18).

The surveys asked people how often they talked about climate change with their friends and family [1 = 'never'; 2 = 'every 6 months'; 3 = 'monthly'; 4 = 'fortnightly'; 5 = 'weekly'; and 6 = 'daily'] to

discover if it was a subject that was an important talking point in everyday life. There was a significant difference in the regularity with which post-communication survey respondents (M = 3.99, SE = 0.10) and pre-communication survey respondents (M = 3.54, SE = 0.05) talked about climate change [t = -4.18, df = 276, *p* (1-tailed) < 0.0005, K-S tests: pre-survey (*D* = 0.201, df = 874, *p* < 0.0005) and post-survey (*D* = 0.208, df = 163, *p* < 0.0005), Mann-Whitney test: *Z* = -3.148, *p* (1-tailed) = 0.001, r = 0.24 – small to medium effect], with those surveyed after the interventions stating that they talked about it more regularly. To give an overall comparison, the percentage of people in each survey group talking about climate change at least monthly was calculated. For the under-18 year old group the percentage discussing climate change at least monthly increased from 63.2% to 84.3%. Also, for the 18 and over age group, the percentage increased from 85.1% to 93.5%. These results suggest that the issue of climate change has become more of a talking point for people after engaging with C-Change.

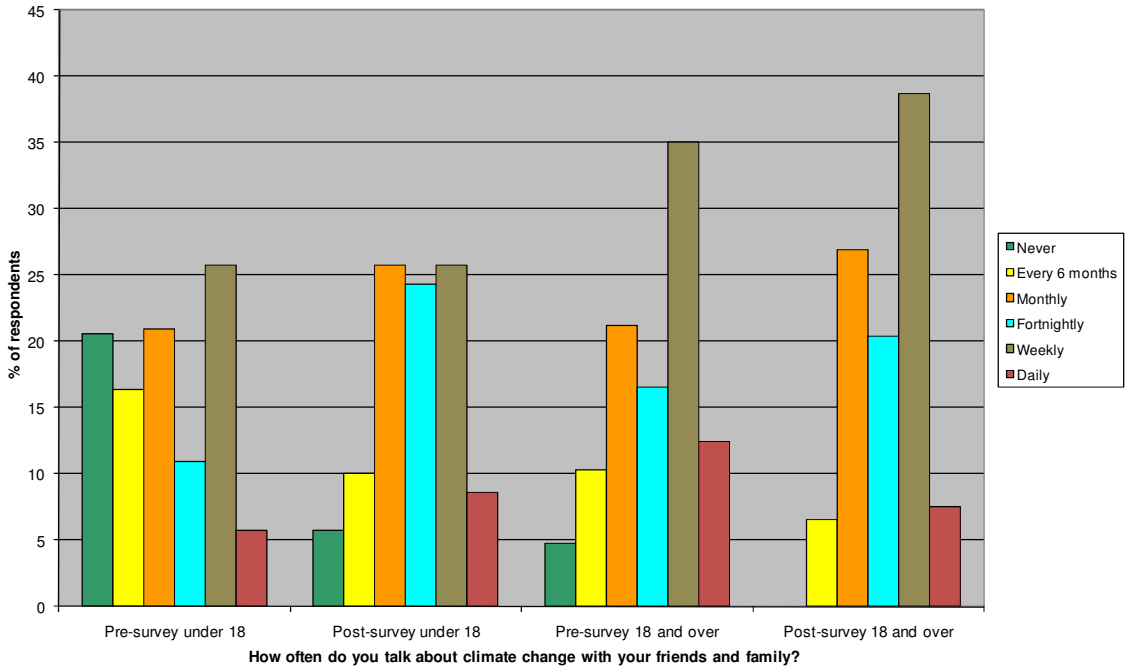


Figure 5.13: Percentage of respondents and the regularity with which they talk about climate change with their family & friends.

As with the results for the Wellingborough Toolkit analysis reported in section 5.1.3.1, two of the six items on the climate change worldview scale provided statistically significant results between pre- and post-communication surveys. Both the significant results were positive in terms of promoting

perceptions of climate change. When asked the extent to which they agreed with a number of statements [response options: 1 = 'strongly disagree'; 2 = 'disagree'; 3 = 'neither agree nor disagree'; 4 = 'agree'; and 5 = 'strongly agree'], respondents were significantly more likely to agree [t-test: t = 2.21, df = 994, p (2-tailed) = 0.03, Mann-Whitney test: Z = -2.342, p (1-tailed) = 0.001, r = 0.07 – small effect] that humans have the right to release into the atmosphere as much carbon dioxide as they wish before receiving communication [M = 1.58, SE = 0.07, K-S test: D = 0.282, df = 837, p < 0.0005] than post-communication [M = 1.58, SE = 0.07, K-S test: D = 0.338, df =159, p < 0.0005]. Additionally, respondents to the post-communication survey (M = 3.23, SE = 0.09) were less likely to agree that humans will eventually be able to provide technological and scientific solutions to climate change [t = 2.06, df = 815, p (2-tailed) = 0.04, K-S tests: pre-survey (D = 0.244, df = 680, p < 0.0005) and post-survey (D = 0.204, df = 137, p < 0.0005), Mann-Whitney test: Z = -2.324, p (1-tailed) = 0.01, r = 0.07 – small effect] than respondents to the pre-communication survey (M = 3.44, SE = 0.04)

5.1.4.10 C-Change conclusions

In relation to the C-Change pre- and post-intervention surveys, the statistics generally showed increases in positive attitudes towards climate change, certainly in terms of statistically significant differences: 21 out of the 23 significant differences identified showed a positive change over the course of the project. In addition to the significance testing, the descriptive analysis of the questionnaire data provided a number of observations. The percentage of individuals who were aware of climate change-related terms was significantly greater after engaging with C-Change, both for under- and over-18 year olds, and concern about climate change increased significantly. For those aged under-18, there was an increase in the extent to which respondents agreed that the climate was actually changing but adults tended to agree to a lesser extent post-intervention. Furthermore, the extent to which survey respondents thought that human behaviour was responsible for climate change was lower in the post-intervention survey. In relation to four pairs of semantic differentials, three out of the four categories (hopeful or fearful, positive or negative and frustrated or enthused), showed a decrease in the percentage of respondents choosing the more positive of the two options The percentage of people who thought that industry and businesses and the government could have a large influence on climate change was significantly greater post-intervention, but less people thought that they personally or their local community could have a large influence. Generally, survey respondents accessed climate change information from a greater number of sources after engaging with C-Change and people tended to talk about the issue significantly more often.

5.1.5 Research question 3 – key findings

Results were mixed in relation to each of the three case studies as some perceptions were more positive after intervention and some were less positive. Given that the aim of the UKCCCI was to change a range of perceptions (i.e. including knowledge, self-efficacy etc.), the positive increases in relation to some of the statistics does show that the three case studies did have some positive outcomes.

In relation to ET, some statistics were more positive post-communication (awareness of the issue; choice of semantic differentials to describe attitudes; and community influence on climate change), some statistics had remained roughly the same (awareness of climate change terms) and some were less positive (individual influence on climate change; concern about the impact of climate change in the UK; belief that the climate was changing; and human responsibility for causing climate change). Similarly, for WT, some statistics were more positive post-communication (awareness of climate change terms; and number of sources through which climate change information was accessed), some were similar (choice of semantic differentials to describe attitudes) and some were less positive (belief that the climate was changing). A similar pattern emerged for C-Change where, again, some descriptive statistics were more positive post-communication (awareness of climate change terms; concern about the impact of climate change in the UK; number of sources through which climate change information was accessed; belief that the climate was changing for under-18 year olds; business and industry, and government, influence on climate change; and regularity at which climate change was discussed), some were roughly the same (choice of semantic differentials to describe attitudes), and some were less positive (human responsibility for causing climate change; belief that the climate was changing for adults; and individual and community influence on climate change). However, in terms of statistically significant differences, C-Change was the most successful project with 21 out of 23 identified differences being positive.

5.1.6 Research question 3 – discussion

White & Wall (2008) suggested that another valuable addition to the climate change communications body of literature would be a longitudinal study of communications methodologies including assessment of, and recommendations about, the most appropriate methodologies. Such a study was conducted here using separate 'before' and 'after' samples for three case studies (ET, WT and C-Change) as it was not logistically possible to track the perceptions of individual recipients of communications.

Considering the raw percentage figures, the statistically significant differences and looking at the number of perceptions that became more positive relative to the number that became less positive, the most successful communications project was C-Change. Research by Devine-Wright et al (2004) and from the free-choice learning literature (Ballantyne & Packer, 2005; Falk, 2005) suggests that this result is not surprising. The C-Change project adopted a free-choice learning approach where individuals did not necessarily attend the communications to be educated about climate change and the settings where communications occurred were generally informal (Heimlich, 2005). Further support for this position is given by Anderssen & Wallin (2000), who advocate peer education as a tool for learning about climate change. The techniques adopted for the C-Change project, where a youth steering committee decided on, and implemented, the communications was an example of peer education. However, none of the three case studies impacted positively on all the variables considered in the questionnaires. All projects increased awareness of the issue of climate change but, as noted above, awareness is already very high throughout both the target audiences of the three case studies and the wider UK population.

As part of the case studies' responsibilities to Defra for receiving funding, they each had to submit a form at the end of the project showing the number of people that had been engaged by their communications. The forms suggested that the number of people directly engaged by each project was: 662 for the Wellingborough Toolkit, which equated to £10.12 for each individual engaged; 8,500 for C-Change, which equated to £29.42 per individual; and approximately 35,000 for Everybody's talking about climate change, which equated to £10.69 per person. In addition to direct engagement (such as from attendance at events, presentations etc.), each project indirectly engaged with a large number of people through various other channels (e.g. websites, radio broadcasts and newspaper articles).

As shown in the analysis, the C-Change project produced the best results in terms of statistically significant positive changes in perceptions. This is perhaps unsurprising given that nearly three times as much money was spent per person engaged. However, the changes in perception following the other two case studies were largely indifferent (and in some cases negative), which suggests that it is better to spend more and reach fewer people than apply a broad brush technique that does not actually achieve significant results. These results therefore support conclusions from several of the studies reviewed in chapter two (e.g. Lorenzoni et al, 2007; Whitmarsh, 2009a); that a targeted approach for different individuals is more likely to result in successful communications interventions. This project cost comparison also provides support to the usefulness of peer education initiatives noted in the paragraph above (Anderssen & Wallin, 2000; Devine-Wright et al,

2004; Falk, 2005). Such initiatives are always likely to be expensive in terms of money and time, but the results speak for themselves.

It would be worthwhile conducting a future study that tracks the attitudes of specific individuals before and after CC communications interventions, as this would provide an analysis from which more robust conclusions could be drawn. Such a methodology would allow the identification of statistically significant differences using within-subject analyses, which are generally more powerful than the between-subjects techniques used in this study (Field, 2005). However, this would prove to be very difficult practically as a large sample size would be needed to ensure sufficient rigour in the data to open it up to the appropriate statistical techniques. Therefore, a large number of respondents would have to be tracked pre- and post-intervention and this would require a large time resource and a willing group of participants. This design would also not lend itself to a study of CC perception change from a campaign such as 'Everybody's talking about climate change', as this involved many different communications channels and actually quantifying the engagement would not be possible. Where a specific intervention was carried out (e.g. attending a 'Wellingborough Toolkit' presentation), such an experimental design would be possible, but would require careful planning and be logistically complicated. The methodology adopted for the qualitative study (the template analysis reported below in section 5.3), where people who had already taken part in interventions were asked questions about what they thought of the process, was designed to get round this in some way.

Furthermore, as there is so much climate change information in the public domain (Ereaut & Signaut, 2007), it is difficult to say for certain that changes in perception are down to a given intervention as individuals receive so much information about climate change from such a large number of sources. This is particularly difficult to confirm for interventions that operate across a long time period. For example, the UKCCCI projects considered here received funding for interventions lasting between one and two years, so people taking part in the projects would most likely have been influenced by a range of other sources.

Another good avenue for future research would be a study of all the evaluation material from the different projects funded under the UKCCCI (each project had to submit an evaluation report). Given the scope of the initiative and the variety of projects that it funded, such an analysis would allow more definitive conclusions as to the most successful climate change communications techniques than this before-after analysis of three case studies.

5.1.7 Research question 3 – conclusions

The analysis reported above has shown that communications interventions can contribute to changes in perceptions of climate change. Each of the case studies provided some positive results, but they also had some negative impacts. In terms of statistically significant, positive changes in perceptions of climate change, the C-Change project was by far the most successful. However, it has also been noted that it is difficult to isolate the specific effect from a given intervention that operates over a significant time period as individuals receive climate change information from lots of places. When designing and evaluating a communications project or initiative, it is important to focus on desired outcomes (i.e. positive changes in perceptions), rather than trying to reach as many people as possible. The results reported above suggest that attempting to maximise the number of individuals reached may detract from the communications and actually be counter-productive in terms of positively influencing the perceptions of the target audience. The analysis has also highlighted that peer education, although expensive to fund, is a useful tool for climate change initiatives and it is recommended that future programmes similar to Defra's UKCCCI advocate this approach.

5.2 Segmentation of communications target audiences by socio-demographic variables

5.2.1 Introduction

Research question 4 is addressed using the pre-communication survey data from the 'Everybody's talking about climate change' case study. These data were collected relatively early in the PhD process (see section 3.2.5.2) and the analysis was completed prior to the administration of the ET post-communication survey. This analysis is also included in the research paper published in *Local Environment* (White & Wall, 2008).

The entire dataset was available for the N&D sample and was used to see whether sections of the N&D population differ in their perceptions of climate change. Chi-square tests were run using the three independent variables (age group, gender and county of residence) and the categorical questions in the survey (i.e. concern about climate change, awareness of climate-related terms). There were a total of 33 dependent, categorical variables in the questionnaire. All significant differences were identified and are reported below under the relevant independent variable heading. Chi-square tests are used to establish if two categorical variables are associated (Tabachnick & Fidell, 1996). In this thesis results are considered significant when $p \leq 0.05$, which corresponds to a 95% likelihood that the results of the test are actually due to an association between the variables and not simply due to chance. This level of significance is commonly used in social scientific testing (Field, 2005). Chi-square tests are also subject to various assumptions, which are calculated during the analysis and, if violated, mean that the test results are not valid. In

each of the tests described below, the minimum expected cell frequency was examined to ensure that at least 80 per cent of cells had expected frequencies of five or more (Pallant, 2001). In addition, if there are only two categories in each of the variables, it may lead to an overestimation of the chi-square statistic and 'Yates' Correction for Continuity' replaces the Pearson chi-square test statistic (Ibid.). In relation to the research question, a significant difference in perceptions implies that there is sufficient difference between groups to suggest there might be value in a varied approach to communications, which in turn would suggest that segmentation of the target audience would be appropriate and worthwhile.

5.2.2 Comparing perceptions by county of residence, gender and age groups

5.2.2.1 Association between county of residence and perceptions

Only two statistically significant differences between residents of the two counties were identified from all the possible survey questions (see appendix 1 for a copy of the survey) and the chi-square test results are shown in Table 5.2. In other analyses, test results were either non-significant or the assumptions of the chi-square test were violated. In the case of 'awareness of the term the greenhouse effect', both groups were highly aware, which suggests that devolution of communications to single-county level may not be necessary. This notion is supported by 'personal contribution to burning fossil fuels for energy' where both groups appeared to display a lack of knowledge about their actions. The rarity of significant differences also points to the conclusion that devolution to single-county level may not be worthwhile. Overall, the results support not devolving communications to single-county level because although significant differences do exist, they are few in number and where they do occur, both Nottinghamshire and Derbyshire residents are either both high or both low in terms of the percentage results.

Question	% of Notts. respondents answering 'yes'	% of Derbys. respondents answering 'yes'	Yates' Continuity Correction	Significance, *p*
Are you aware of the term 'the greenhouse effect'?	98.5	92.9	4.24	0.039
Do you personally contribute to burning fossil fuels for energy?	29.3	47.3	8.34	0.004

Table 5.2: Significant ($p \leq 0.05$) differences between Nottinghamshire and Derbyshire residents using chi-squared tests.

5.2.2.2 Association between gender and perceptions

There were a total of nine significant differences between males and females, as shown by the chi-square results in Table 5.3. Despite the significant differences, there was a high reported awareness of the terms 'greenhouse effect' and 'carbon emissions' from females and males. There was also a significant difference in the extent to which males and females said that they personally contributed to a number of climate-related problems: emissions from cars/vans/buses; carbon dioxide (CO_2) emissions; pollution; and the burning of fossil fuels. In all cases, males expressed a greater awareness of how their own actions may contribute to climate change. Men were also significantly more likely than women to report that they discuss CC with family and friends. Each respondent was given a number of points depending on the regularity with which they reportedly talked about climate change ('Never' = 1, 'Every 6 months' = 2, 'Monthly' = 3, 'Fortnightly' = 4, 'Weekly' = 5, 'Daily' = 6). The average points scores were: whole sample = 3.08; males = 3.32; and females = 2.84. On the other hand, females were significantly more likely to report that they personally, and their local community, could have an influence on limiting climate change. These results suggest that there are some perceptions that could be addressed through different interventions for males and females.

Significant relationships involving dichotomous variables

Question	% of male respondents answering 'yes'	% of female respondents answering 'yes'	Yates' Continuity Correction	Significance, *p*
Are you aware of the term 'the greenhouse effect'?	98.7	92.2	5.88	0.015
Are you aware of the term 'carbon emissions'?	94.0	85.2	5.36	0.021
Do you personally contribute to emissions from cars/vans/buses?	80.3	68.7	4.49	0.034
Do you personally contribute to CO_2 emissions?	73.7	60.6	4.78	0.029
Do you personally contribute to pollution?	68.8	56.2	4.16	0.041
Do you personally contribute to the burning of fossil fuels?	47.8	30.1	8.14	0.004

Significant relationships involving non-dichotomous variables		
Question	**Pearson chi-square**	**Significance, *p***
How often do you talk about climate change with your friends and family?*	16.86 (with males discussing CC more often)	0.005
How much influence can you personally have on limiting climate change?†	12.84 (with females thinking they can have a greater influence)	0.005
How much influence can your local community have on limiting climate change?†	11.73 (with females thinking they can have a greater influence)	0.008

* options are 'never', 'every 6 months', 'monthly', 'fortnightly', 'weekly' or 'daily
† options are 'no influence', 'a little influence', 'some influence' or 'a large influence'

Table 5.3: Significant ($p \leq 0.05$) differences between male and female residents of Nottinghamshire & Derbyshire using chi-squared tests.

5.2.2.3 Association between age and perceptions

There are a total of eight significant differences between respondents of different age groups shown by the chi-square results reported in Table 5.4. The oldest group appeared to lack knowledge about how they, as individuals, contribute to climate change, as shown by the last three test results in Table 5.4. Those aged 65 and over also reported hearing about climate change through fewer channels, suggesting that it is particularly important for communications to reach this group. Conversely, the older age group are significantly more likely to be hopeful than fearful in their attitude towards climate change (as measured by a semantic differential). This latter statistic may be a reflection of their lack of knowledge about climate change (as highlighted previously) or even the fact that the older a person is, the less likely they are to witness the impacts of climate change, leading them to be more hopeful in the face of such a large problem, or it may be simply that their outlook is a more positive one. Either way, the results suggest that targeting different age groups with different interventions would be a useful policy.

Question	**% 18-24 year olds answering 'yes'**	**% 25-64 year olds answering 'yes'**	**% 65 and over answering 'yes'**	**Pearson chi-square**	**Significance, *p***
Have you heard charities or pressure groups talking about climate	71.0	61.5	31.1	33.0	<0.0005

change?					
Have you heard your friends and family talking about climate change?	79.2	71.0	55.4	9.64	0.008
Have you heard celebrities talking about climate change?	62.5	59.6	37.2	14.97	0.001
Have you heard children talking about climate change?	43.5	38.5	25.0	7.1	0.029
Would you use the word hopeful to describe your attitude to climate change (as opposed to fearful)?	45.8	44.1	60.6	7.65	0.022
Do you personally contribute to emissions from cars/vans/buses?	90.9	83.9	67.8	11.42	0.003
Do you personally contribute to CO_2 emissions?	87.0	81.5	57.6	18.59	<0.0005
Do you personally contribute to pollution?	80.3	78.3	52.8	19.69	<0.0005
For the last three questions above (as the percentages were very similar for 18-24 and 25-64 year olds), significance tests were conducted without the '65 and over' age group showing that the '18-24' and '25-64' groups did not differ significantly. This suggested it would be more appropriate to divide the sample into two age groups for the chi-square tests, '18-64' and '65 and over'. The results are shown below and Yates' continuity correction is used as both variables are now dichotomous.					
Question	**% 18-64 year olds answering 'yes'**	**% 65 and over answering 'yes'**	**Yates' Continuity Correction**	**Significance, *p***	
Do you personally contribute to emissions from cars/vans/buses?	85.3	67.8	10.01	0.002	
Do you personally contribute to CO_2 emissions?	82.7	57.6	17.23	<0.0005	
Do you personally contribute to pollution?	79.8	52.8	18.52	<0.0005	

Table 5.4: Significant ($p \leq 0.05$) differences between 18-24 year olds, 25-64 year olds and those aged over 65 in Nottinghamshire & Derbyshire using chi-squared tests.

5.2.3 Comparing climate change worldview by gender, county of residence and age group

5.2.3.1 Introduction

The 'New Ecological Paradigm' (NEP) scale (Dunlap et al, 2000) is an attitudinal scale that is designed to measure an individual's ecological worldview (Ibid., 425). Along with an earlier version

of this scale (the 'New Environmental Paradigm', Dunlap & Van Liere, 1978), the NEP has been used in many studies in various contexts over the last 30 years (e.g. Deng et al 2006; Nooney et al, 2003; Pierce et al, 1987). Respondents state their agreement or disagreement with 15 statements, on Likert-type scales (Likert, 1932) about the nature of humanity's relationship with the environment. Half of the statements are positively worded, so that agreement with the statement corresponds to a 'proenvironmental orientation' (Dunlap et al, 2000). The remaining statements are negatively worded, so that disagreement corresponds to a 'proenvironmental orientation'. Results from previous studies suggest that the scale is internally consistent (Ibid.).

One question which was not asked by the COI but was included in the N&D survey presented respondents with six statements (to which they stated the extent to which they agreed or disagreed) about the relationship between humans and climate change. These six statements were based on six of the statements from the NEP scale, but were altered to address perceptions of climate change specifically. An explanation of this is given in section 3.3.2 and Table 3.5 displays the original NEP statements and the altered statements used in this study. The scores for each of these statements were reverse coded before analysis and then combined to give a single measure of climate change worldview. If any respondents had not answered all items or had answered 'not sure' in any instance, they were removed from the analysis as their score would not be an addition of all the items in the scale (i.e. listwise deletion). Fifty-eight per cent of the sample answered all the items, giving a total of 178 valid cases (128 respondents were removed from the analysis). The sample frame for this section of the analysis is shown in Table 5.5 and the scale items (and percentages of responses) in Table 5.6.

	Age range	Number of respondents		
		18-24	25-64	65 and over
Live in Nottinghamshire	Male	5	13	29
	Female	2	13	24
Live in Derbyshire	Male	2	13	28
	Female	8	12	29

Total number of respondents to scale question = 178

Table 5.5: Sampling framework and total number of respondents per category for the scale question when all incomplete cases were removed.

Scale item	% Strongly disagree	% Disagree	% Neither agree nor disagree	% Agree	% Strongly agree

1. We are approaching the point at which the Earth's climate system cannot function	1.7	33.1	18.5	37.1	9.6
2. Humans have the right to release into the atmosphere as much carbon dioxide as they wish *	42.7	52.2	2.8	1.7	0.6
3. The effect of climate change on plants and animals is as important as its effect on humans	1.1	4.5	3.9	46.6	43.8
4. Humans will eventually be able to provide technological and scientific solutions to climate change * †	2.8	15.7	20.2	56.2	5.1
5. Humans are seriously abusing the earth's atmosphere	1.1	3.9	8.4	61.8	24.7
6. The possible consequences of climate change have been greatly exaggerated *	16.9	41.6	10.1	29.2	2.2

* *Indicates which of the scale items were negatively worded and reverse coded for analysis*
† *Indicates which item was removed from the scale for analysis*

Table 5.6: Items used in the 'Climate change worldview' scale and the percentage responses.

The internal reliability of the scale was tested by calculating Cronbach's alpha coefficient (α; Field, 2005). Field (Ibid., 666) states that reliability "means that a scale should consistently reflect the construct it is measuring". According to Cortina (1993), α should be greater than 0.7 for an internally consistent scale. The six items had $\alpha = 0.42$. Removing item 4 (and therefore calculating α using just the five remaining scale items) raised the α value to 0.56. Additionally, the corrected item-total correlation for item 4 was -0.14. Even though 0.56 is lower than recommended, removal of item 4 did provide a more reliable scale than the six-item scale. Therefore, item 4 was removed and analysis carried out with the remaining five items. The five-item scale scores were compared to the three independent variables. This was done to see whether county of residence, age or gender was associated with an individual's view of climate change and, consequently, to see whether there were any implications for targeting communications.

5.2.3.2 Association between gender and worldview in relation to climate change

An independent-samples t-test was used to compare the mean CC worldview scores for males and females. This statistical technique is used to compare the mean score for two groups on a continuous variable (Gravetter & Wallnau, 2004). For the analysis, a t-value and its associated significance are calculated. If a significant difference is discovered, the extent or magnitude of the difference between the groups can be calculated by mathematically manipulating the t-value to provide a value called 'Eta squared' (η^2). Cohen (1988) suggests the following guidelines for interpreting η^2: $\eta^2 = 0.01$, small effect; $\eta^2 = 0.06$, moderate effect; and $\eta^2 = 0.14$, large effect. If η^2

is multiplied by 100, it gives the percentage variance (standard deviation squared) in CC worldview that can be explained by gender (Pallant, 2001).

Figure 5.1 shows the frequency distribution of CC worldview scores for males and females (with the black line showing a normal curve). It is evident from these graphs that both groups conform approximately to a normal distribution. To ensure this was the case, a Kolmogorov-Smirnov test (K-S, expressed as *D*) was used. A non-significant result indicates that the distribution of the sample is not significantly different from a normal distribution (Field, 2005). K-S tests showed that the males' scores ($D = 0.091$, df = 90, $p = 0.064$) were normally distributed but the females' scores were non-normal ($D = 0.109$, df = 88, $p = 0.012$). When dealing with a large sample size, the K-S test may overemphasise small deviations from normality (Field, 2005; Pallant, 2001). Even though 88 females did not constitute a very large sample size (Oppenheim, 1992), it was decided to carry out the t-test anyway, given the closeness to normality apparent in Figure 5.23. No significant difference in CC worldview scale scores was observed between females (Mean, M = 19.64, Standard deviation, SD = 2.78) and males (M = 18.94, SD = 2.67) [t = -1.69, df = 176, *p* (2-tailed) = 0.09]. This suggests that, despite the fact that women had a higher mean score on the scale, they were not significantly more positive in their view of climate change than men.

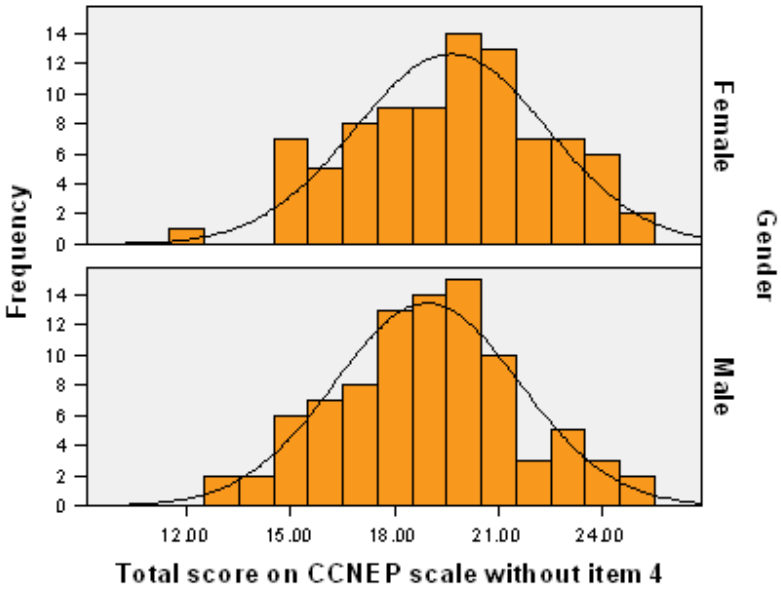


Figure 5.23: Histograms showing the frequency distribution of scores on the CC worldview scale for males and females.

5.2.3.3 Association between county of residence and worldview in relation to climate change

Again, an independent samples t-test was the appropriate parametric test to assess differences in scale scores between residents of the two counties. However, the frequency distributions of CC worldview scores for Nottinghamshire and Derbyshire residents were both close to normal, but the K-S tests suggested non-normal distributions for both groups: Nottinghamshire (D = 0.116, df = 86, p = 0.006); and Derbyshire (D = 0.144, df = 92, $p < 0.0005$). Consequently, the non-parametric equivalent to the t-test (the Mann-Whitney U test) was carried out. Non-parametric statistical tests do not require normally distributed scores and can therefore be used if the data does not conform to a normal distribution (Field, 2005). However, the non-parametric tests are less powerful statistically, meaning that, if the data are normally distributed, the parametric tests should be used. The Mann-Whitney U test showed that there was no significant difference in CC worldview scale scores between Nottinghamshire and Derbyshire residents [Z = -0.258, p (2-tailed) = 0.797], suggesting that communications may not need to target residents of the two counties separately.

5.2.3.4 Association between age and worldview in relation to climate change

In the survey, respondents were categorised into three age groups ('18-24', '25-64' and '65 and over'). Therefore, a one-way analysis of variance (ANOVA) was used for this analysis. ANOVA is used when the independent variable (in this case, the age of the respondent) is not dichotomous. The analysis is very similar to the t-test and an F-value and associated significance are calculated. Once again, η^2 can be calculated to give the percentage of variance explained by the independent variable and Cohen's (1988) guidelines are used to interpret η^2. Figure 5.24 shows the frequency distribution of CC worldview scores for respondents from different age groups (with the black line showing a normal curve). It is evident from these graphs, and from K-S tests, that the '18-24' (D = 0.134, df = 17, p = 0.2), '25-64' (D = 0.116, df = 51, p = 0.082) and the '65 and over' (D = 0.08, df = 110, p = 0.079) age groups all conformed to a normal distribution and the assumptions for the one-way ANOVA were met. One-way ANOVA showed no significant difference in mean CC worldview scale scores between people aged 18-24 ($\underline{M}$ = 19.29, SD = 2.66), people aged 25-64 ($\underline{M}$ = 19.39, SD = 2.68) and those aged 65 and over ($\underline{M}$ = 19.24, $\underline{SD}$ = 2.80) [F = 0.056, df = 2, p = 0.946].

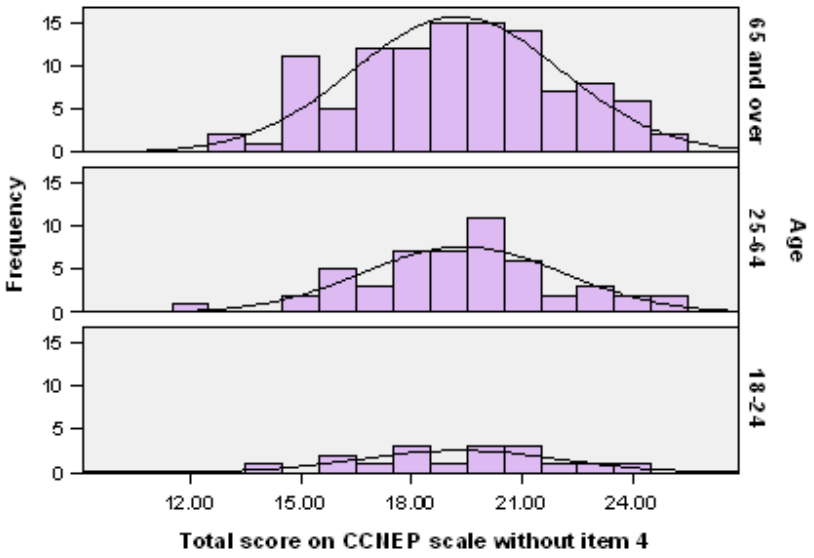


Figure 5.24: Histograms showing the frequency distribution of scores on the CC worldview scale for survey respondents in different age groups.

5.2.4 Analysis of individual scale items

Given that the creation of the CC worldview scale resulted in the deletion of nearly half the sample and the alpha coefficient was 0.56, it was decided that each of the items should also be analysed individually. Presented below is an analysis of the difference between socio-demographic groups (county of residence, gender and age – independent variables) in response to each individual statement (the dependent variable). This is presented alongside the previous section, which attempted to combine the items to create an internally consistent scale for future research in this area.

5.2.4.1 Methodology

Independent samples t-tests or one-way analysis of variance (ANOVA) were used to compare groups, depending on the number of response options into which the independent (grouping) variable was categorised. Gender (male or female) and county of residence (Nottinghamshire or Derbyshire) had two categories, so the relevant statistical test was the t-test. Age was split into three categories ('18-24', '25-64' and '65 and over') and therefore ANOVA was relevant. ANOVA and the t-test are both parametric tests and as such there are a number of assumptions which must be met for the test results to be valid, such as conformity to a normal distribution. If the assumptions are not met, an equivalent, non-parametric test can be used which does not require

normally distributed data. The equivalent to the independent samples t-test is the Mann-Whitney test and the equivalent to ANOVA is the Kruskal-Wallis test. Tables 5.7, 5.8 and 5.9 show the results of the relevant tests by each scale item, along with a description of how the data are distributed on a histogram and Kolmogorov-Smirnov tests (which identify statistically if data is normally distributed – see section 5.2.3.2), before identifying whether the differences between groups are statistically significant. Any respondents that did not provide an answer to the question or answered 'don't know' were removed from the analysis. As noted previously, when using large samples, the K-S tests may overemphasise deviations from normality; as such, in cases wherethe plotting of a histogram and K-S tests indicate a non-normal distribution, the t-value from the independent samples t-test is reported for completeness.

5.2.4.2 Comparing responses by county of residence

Table 5.7 shows that respondents from the two different counties of Nottinghamshire and Derbyshire did not differ significantly in their response to any of the scale items. These results are not unsurprising given the analysis presented in section 5.2.2.1, which also showed very little difference in perceptions between the two groups.

Statement	t-test	Histograms	K-S test (live in Notts)	K-S test (live in Derbys)	Mann-Whitney test	Relation-ship
1. We are approaching the point at which the Earth's climate system cannot function	t = -0.571 df = 249 p = 0.569	Both close to normal distribution	D = 0.253 df = 118 p<0.0005	D = 0.243 df = 133 p<0.0005	Z = =0.581 p = 0.561	Not significant
2. Humans have the right to release into the atmosphere as much carbon dioxide as they wish	t = -1.295 df = 288 p = 0.196	Both skewed towards 'disagree'	D = 0.320 df = 124 p<0.0005	D = 0.299 df = 156 p<0.0005	Z = 1.082 p = 0.279	Not significant
3. The effect of climate change on plants and animals is as important as its effect on humans	t = 0.869 df = 286 p = 0.385	Both skewed towards 'agree'	D = 0.268 df = 131 p<0.0005	D = 0.301 df = 157 p<0.0005	Z = -0.757 p =0.449	Not significant
4. Humans will eventually be able to provide technological and scientific solutions to climate change	t = -1.339 df = 209 p = 0.182	Both skewed towards 'agree'	D = 0.335 df = 107 p<0.0005	D = 0.354 df = 121 p<0.0005	Z = -1.051 p = 0.293	Not significant
5. Humans are seriously abusing the earth's	t = 1.535 df = 283 p = 0.126	Both skewed towards	D = 0.313 df = 130 p<0.0005	D = 0.394 df = 155 p<0.0005	Z = -1.541 p =0.123	Not significant

atmosphere		'agree'				
6. The possible consequences of climate change have been greatly exaggerated	t = 0.162 df = 255 *p* = 0.871	Both close to normal distribution	*D* = 0.267 df = 118 *p*<0.0005	*D* = 0.298 df = 139 *p*<0.0005	*Z* = -0.194 *p* = 0.847	Not significant

Table 5.7: Identifying significant differences between residents of Nottinghamshire and Derbyshire in their agreement with statements about the relationship between humans and climate change

5.2.4.3 Comparing responses by gender

From the analysis of all six individual items presented in table 5.8, there was one significant difference in response between males and females. Females were significantly likely to agree to a greater extent that the effect of climate change on plants and animals is as important as its effect on humans. The size of this effect (*r*) can be estimated by mathematically manipulating the z-value (Field, 2005) using the equation:

$$r = Z / \sqrt{N}$$

After removing all the respondents that did not answer or answered 'don't know' to statement three, the remaining sample size (N) was 288. Therefore the effect size was 0.15 which represents a small effect.

Statement	t-test	Histograms	K-S test (males)	K-S test (females)	Mann-Whitney test	Relation-ship
1. We are approaching the point at which the Earth's climate system cannot function	t = 0.606 df = 249 *p* = 0.545	Both close to normal distribution	*D* = 0.247 df = 130 *p*<0.0005	*D* = 0.241 df = 121 *p*<0.0005	*Z* = -0.585 *p* = 0.559	Not significant
2. Humans have the right to release into the atmosphere as much carbon dioxide as they wish	t = 0.897 df = 288 *p* = 0.37	Both skewed towards 'disagree'	*D* = 0.335 df = 145 *p*<0.0005	*D* = 0.268 df = 145 *p*<0.0005	*Z* = -1.23 *p* = 0.219	Not significant
3. The effect of climate change on plants and animals is as important as its effect on humans	t = -2.298 df = 286 *p* = 0.022	Both skewed towards 'agree'	*D* = 0.325 df = 147 *p*<0.0005	*D* = 0.278 df = 141 *p*<0.0005	*Z* = -2.545 *p* = 0.011	Significant difference: Females, <u>M</u> = 4.36 Males, <u>M</u> = 4.15
4. Humans will eventually be able to	t = 0.151 df = 226	Both skewed	*D* = 0.298 df = 115	*D* = 0.397 df = 113	*Z* = -0.118 *p* = 0.906	Not significant

provide technological and scientific solutions to climate change	p = 0.88	towards 'agree'	p<0.0005	p<0.0005		
5. Humans are seriously abusing the earth's atmosphere	t = -1.118 df = 283 p = 0.265	Both skewed towards 'agree'	D = 0.377 df = 142 p<0.0005	D = 0.335 df = 143 p<0.0005	Z = -0.781 p = 0.435	Not significant
6. The possible consequences of climate change have been greatly exaggerated	t = 0.235 df = 255 p = 0.814	Both close to normal distribution	D = 0.288 df = 126 p<0.0005	D = 0.279 df = 131 p<0.0005	Z = -0.246 p = 0.805	Not significant

Table 5.8: Identifying significant differences between males and females in their agreement with statements about the relationship between humans and climate change

5.2.4.4 Comparing responses by age group

Table 5.9 shows the results of the analysis for each scale item by age group. Two significant differences were found between respondents from the three age groups. Firstly, older respondents were significantly more likely to agree that the effect of climate change on plants and animals is as important as its effect on humans; the mean response on the agreement scale increased from '18-24' year olds to those aged '25-64', and again to respondents aged '65 and over'. The second significant difference between age groups was in relation to the extent of agreement with the statement 'Humans will eventually be able to provide technological and scientific solutions to climate change'. Respondents aged '18-24' agreed to the greatest extent with this statement, followed by those aged '65 and over', with those aged '25-64' agreeing to the least extent.

Statement	ANOVA	Histograms	K-S test (aged 18-24)	K-S test (aged 25-64)	K-S test (aged 65 and over)	Kruskal -Wallis test	Relation-ship
1. We are approaching the point at which the Earth's climate system cannot function	F = .199 df = 2 p = .819	'18-24' not normally distributed; '25-64' and '65 and over' both close to normal	D = .243 df = 21 p = .002	D = .264 df = 75 p<.0005	D = .235 df = 145 p<.0005	H = .323 df = 2 p = .851	Not significant
2. Humans have the right to release into the atmosphere as much carbon dioxide as they wish	F = 1.024 df = 2 p = .361	All skewed towards 'disagree'	D = .335 df = 23 p<.0005	D = .318 df = 89 p<.0005	D = .314 df = 178 p<.0005	H = 1.093 df = 2 p = .579	Not significant

3. The effect of climate change on plants and animals is as important as its effect on humans	F = 1.349 df = 2 *p* = .261	All skewed towards 'agree'	*D* = .393 df = 23 *p*<.0005	*D* = .351 df = 90 *p*<.0005	*D* = .278 df = 175 *p*<.0005	*H* = 6.346 df = 2 *p* = .042	Significant difference: '18-24', M = 4.13 '25-64', M = 4.17 '65 and over', M = 4.31
4. Humans will eventually be able to provide technological and scientific solutions to climate change	F = 3.797 df = 2 *p* = .024	All skewed towards 'agree'	*D* = .322 df = 19 *p*<.0005	*D* = .300 df = 63 *p*<.0005	*D* = .368 df = 146 *p*<.0005	*H* = 7.955 df = 2 *p* = .019	Significant difference: '18-24', M = 3.79 '25-64', M = 3.22 '65 and over', M = 3.52
5. Humans are seriously abusing the earth's atmosphere	F = 1.825 df = 2 *p* = .163	All skewed towards 'agree'	*D* = .347 df = 22 *p*<.0005	*D* = .365 df = 86 *p*<.0005	*D* = .354 df = 177 *p*<.0005	*H* = 4.915 df = 2 *p* = .086	Not significant
6. The possible consequences of climate change have been greatly exaggerated	F = .677 df = 2 *p* = .509	All close to normal distribution	*D* = .268 df = 21 *p*<.0005	*D* = .360 df = 80 *p*<.0005	*D* = .245 df = 156 *p*<.0005	*H* = 1.218 df = 2 *p* =.544	Not significant

Table 5.9: Identifying significant differences between age groups in relation to their agreement with statements about the relationship between humans and climate change

5.2.5 Research question 4 – key findings and discussion

Nottinghamshire and Derbyshire residents answered several climate change survey questions and responded to a six-item scale. All survey items were tested against three socio-demographic variables to discover any significant differences between groups. Answers were to the scale question were analysed in two ways: the scale items were combined to obtain a single measure of climate change worldview, which resulted in the deletion of one of the six items; and, for the sake of completeness, the same comparison was done for each individual item, given that the creation of the scale resulted in deletion of a significant proportion of the sample.

County of residence was apparently unrelated to awareness of, attitudes towards, and worldview in relation to, climate change. However, differences were noted between males and females. Women in N&D expressed a more positive worldview (although the difference between women and men

was not statistically significant) and were significantly more likely than their male counterparts to report that they could do something about climate change. However, women displayed less knowledge of their contribution to climate change and reportedly talked about the issue less often. This is interesting given that "think global, act local" has been an important aspect of the sustainability agenda since the United Nations Conference on Environment and Development in 1992 (Alabastar and Hawthorne 1999), and suggests that females in Nottinghamshire and Derbyshire, despite the issues highlighted above, may be more ready to embrace local solutions to climate change. These gender differences are unsurprising in light of work by Buckingham-Hatfield and Matthews (1999, 108), who state that "women realise and demonstrate their environmental concerns in different ways than do men and also prioritise them in different ways". Consequently, males and females might be influenced by different interventions. Males may require an inspiring message to give them the necessary "get up and go" attitude to impact on climate change, given that they already have knowledge of how the process works. On the other hand, women may require an approach that attempts to increase their knowledge and the frequency with which they talk about the issue.

In relation to age, older people tended to report less positive perceptions of climate change than younger people. Those aged over 65 had a lower awareness of the impact of their actions, so may benefit from being targeted with basic scientific information. As noted by Bulkeley (2000) in her description of the information deficit model of ESB interventions, this may not necessarily lead to behaviour change, but it could increase the knowledge levels of older citizens. Utilising a focus group and questionnaire methodology, Haq et al (2007) reached a similar conclusion. They state that the over-50s' "understanding of the full range of impacts of climate change is often limited" (Ibid., 2). As demonstrated by the finding that older people tend to access information about climate change through fewer channels than younger people, it may also be worthwhile attempting to influence the number of communication channels through which older people access climate change information.

In order to reduce the problems associated with climate change, humans need to consider the impacts of their climate-related behaviour and act to reduce those impacts (Gardner & Stern, 1996). Many factors influence how an individual behaves, including psychological variables such as attitudes and values (Stern, 2000a). This study has shown that some differences exist between socio-demographic groups within the regional population. Therefore, projects may benefit from applying different communication techniques for these groups. The research also highlights the importance of understanding the nature of the target audience. In this case, by exploring the knowledge, attitudes and values of socio-demographic groups, it was possible to suggest different

messages about climate change that might be beneficial for influencing different individuals. As noted in chapter 2, Barr and Gilg (2006) categorised people based on their behavioural patterns (the extent to which they performed different ESBs) and found that each group was characterised by different attitudes and values. This approach may be a very useful basis on which to segment populations and identify target audiences for climate change (or wider sustainability and environmental) communications, but it requires the collection of behavioural data which is likely to be much more labour-intensive and time-consuming than segmentation by socio-demographics. Practically, the choice of methodology adopted (i.e. using socio-demographics or behavioural groups) would depend on the nature of the project and the amount of funding available. It is proposed that for projects with the level of resources available through the UKCCCI Climate Challenge Fund (such as the case studies considered herein), tailoring to socio-demographic groups seems worthwhile.

As Whitmarsh (2009a) points out "customised information [about climate change] is likely to have a greater impact on action", adding further credence to the conclusions drawn from this research. By identifying the type of information or incentive an individual or group of individuals might require to alter their perceptions, communicators are likely to receive greater success. Similarly to targeting by behavioural group (Barr & Gilg, 2006) as noted above, such a technique is likely to be more expensive or time-consuming, so practically the methodology used for such a communications initiative is likely to involve a balance between available resources and desired outcomes.

A scale was developed from the 'New Environmental Paradigm' (NEP) scale (Dunlap & Van Liere, 1978; Dunlap et al, 2000) to tap climate change worldview. As the authors point out (Ibid.), the NEP scale has two very useful applications: for tracking endorsement of a pro-environmental worldview over a period of time; and for comparing endorsement of a pro-environmental worldview 'before' and 'after' interventions that are designed to change individuals' views. Given that climate change is such a large-scale issue that operates across such a long timeframe (IPCC, 2007) and that there are a huge range of interventions designed to impact on the psychological factors (Stern, 2000a) that contribute to climate-related behaviour (i.e. Defra, 2006a, Defra, 2009), it is argued here that it is necessary to have a scale to track climate change worldview. Even though climate change is one of many global environmental problems associated with human activity (Bulkeley, 2000), it is important enough in its own right that a specific scale (rather than a general scale tapping environmental worldview) is used to monitor projects that directly aim to influence climate-related attitudes, knowledge and awareness, such as those considered in this thesis. The scale created here was not internally consistent at the $\alpha \geq 0.70$ level, but it did allow changes in worldview before and after the interventions to be monitored. It is recommended that future research into

practical methods of climate change communications develops the scale used in this thesis and attempts to create an internally consistent scale that can be used in both academic and practical monitoring and evaluation projects. As noted above, analysis was also carried out with individual scale items given the lack of internal consistency and the reduction on sample size carried out to create the scale.

5.2.5 Research question 4 - conclusions

The analysis reported above has shown that perceptions of climate change do not differ greatly between residents of two counties within the same region (in this case Nottinghamshire and Derbyshire). This suggests that, although differences in perceptions do exist between national- and two-county-levels (see section 4.2) there appear to be insufficient differences between the two counties to suggest there might be value in segmentation of communications.

However, significant differences were found between some subgroups (age group and gender) of the two-counties sample, suggesting that attitudes differed sufficiently within the 'Everybody's talking about climate change' audience to warrant identifying and targeting particular population segments within the geographical area. In relation to gender, women in N&D expressed a more positive worldview (although the difference between women and men was not statistically significant) and were more likely than their male counterparts to report that they could do something about climate change. However, women displayed less knowledge of their contribution to climate change and reportedly talked about the issue less often. In relation to age, older people tended to report less positive perceptions of climate change than younger people.

.

The research has identified the need for a scale that defines attitudes towards climate change, which can be used across contexts and which will enable researchers to build up a coherent understanding of such attitudes through meaningful cross-context comparisons. The climate change worldview scale used in this survey was a first attempt at this and even though it was not internally consistent (at the $\alpha \geq 0.70$ level), it may be a useful starting point for future research. Indeed, an internally consistent scale could have been usefully employed across the whole range of UKCCCI projects to allow cross-project comparisons.

In conclusion, the results of this study show that there are significant differences in perceptions of climate change between different socio-demographic groups within a target population for climate change communications (in this case the population of Nottinghamshire and Derbyshire, which was the target audience for the ET campaign). A number of significant differences were found between males and females, and between different age groups. Therefore, segmenting by socio-

demographic variables (age and gender) in order to target communications to different people within a given target audience is a worthwhile process. The same may be true in other regions of the UK and this is an obvious avenue for further research. Practically, the method used for segmenting the target audience (i.e. by socio-demographic variable or behavioural group) for a climate change, or wider environmental, communications project or initiative will depend on the availability of time and funding

5.3 The impact of different climate change communications methods

5.3.1 Introduction

The 20 interview respondents had taken part in a Wellingborough Toolkit (WT) presentation or engaged with the Everybody's talking about climate change (ET) campaign. Ten respondents were interviewed for each case study project. With regard to ET, they may have engaged with the campaign in more than one way. For example, an individual respondent could have logged on to the website, explored the pledge bus and heard an advertisement on local radio. The respondents – who were the same participants as those who completed the 3CM interviews described in section 4.1 – were asked several questions about the interventions they had taken part in (see interview schedule in Appendix 2) and a template analysis of their responses is reported below. The template analysis involved reading through the interview transcripts and coding and recoding the data to identify common themes expressed by more than one participant during the interviews (see section 3.2.5.3). The results are presented as themes, which are illustrated by direct quotes from the respondents. Separate template analyses were conducted in relation to each intervention.

5.3.2 Template analysis of data from 'Everybody's taking about climate change'

There were several themes evident from the analysis of the ET interviews and a tree diagram of the codes is shown in figure 5.4. The tree diagram shows 'higher' and 'lower' order codes, where several lower order codes can be combined to form a higher order code. For example, individuals referred to making a pledge in several ways, so 'pledge' was considered a higher order code. Beneath the 'pledge' code there are several lower order codes, for example where respondents suggested that they were already doing the actions on the pledge list. These codes cover all the main themes referred to in the interviews by at least two participants and represent what the interviewees collectively thought about the 'Everybody's talking about climate change' campaign. The results are organised and described below, first of all, by the higher order theme. This is followed by the lower order themes, an explanation and example quotes to illustrate the themes' content.

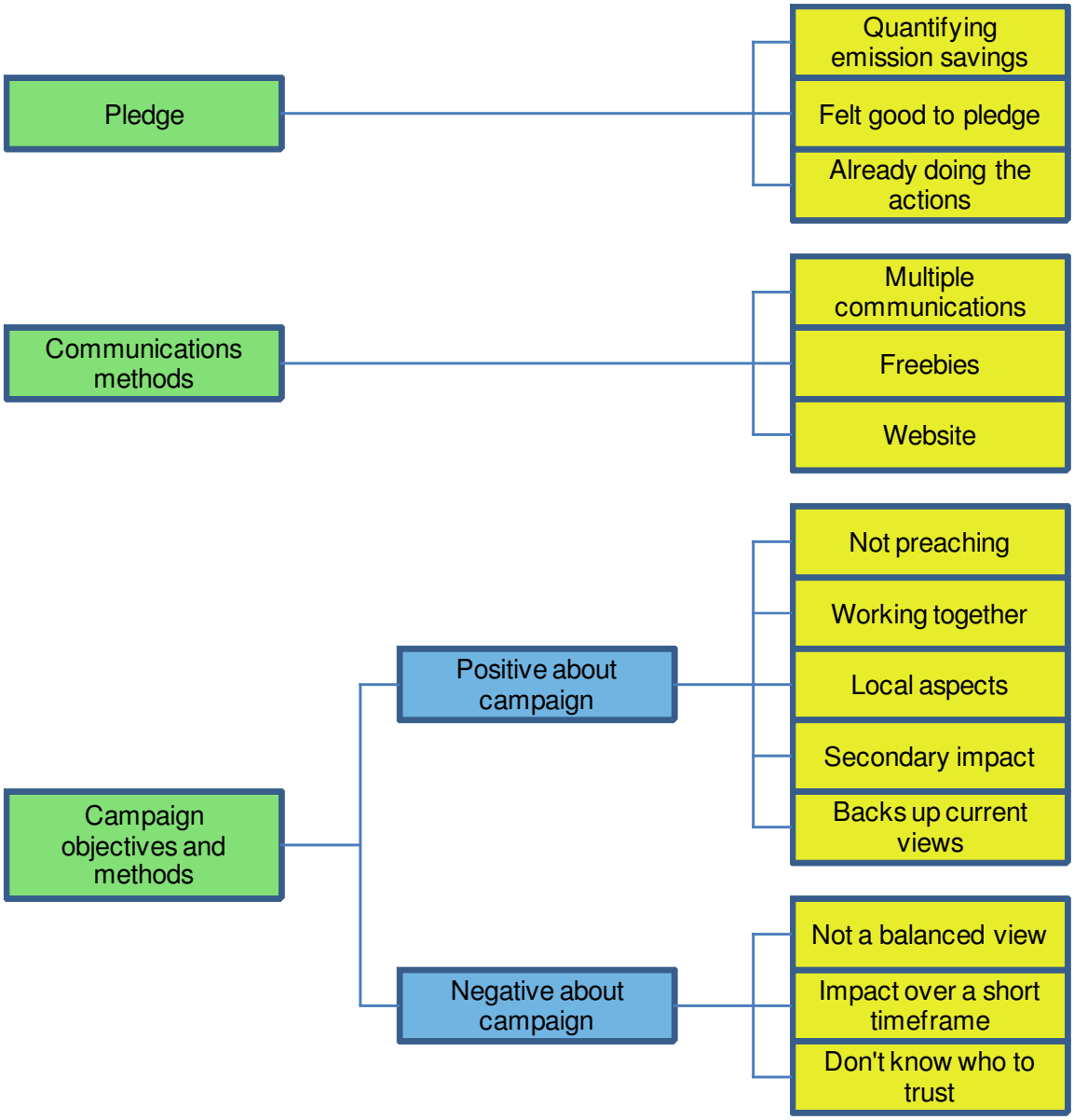


Figure 5.4: Category tree diagram showing the themes identified from ET interviews.

Pledge

This theme covers all the incidences where the pledge was referred to and is split into three sub-themes. There are positive and negative aspects to this theme.

Quantifying emissions savings

Participants were positive about the fact that the emissions savings were quantified as part of the ET communications. Carbon savings were specified in relation to each action participants pledged to undertake or they received an information sheet about the amount of emissions that could be saved from certain actions. This meant that individuals could see what impact they could have if they changed their behaviour.

> *"It was nice to see how much we could change, how much the savings were. Because if everybody could save two tonnes of carbon…"*
>
> (Interviewee 7)

> *"We were given a dial of the amount of CO2 emitted from certain actions, which is quite interesting"*
>
> (Interviewee 9)

Felt good to pledge

Several interviewees stated that they felt positive about actually making a pledge to change their behaviour, suggesting that this particular method of communication was a useful channel for the project.

> *"I suppose it was semi-pleasing to take part in something that could make a difference"*
>
> (Interviewee 5)

> *"It felt good. It would feel good, wouldn't it?"*
>
> (Interviewee 9)

Already doing the actions

This theme was mentioned by nearly all the participants in the interviews. They stated that they were already doing most or all of the actions that were included on the pledge form and that they often only ticked the actions that they were already doing. This is an important point to consider for future communications campaigns that involve persuading the target audience to pledge to reduce their emissions. Such a pledge should involve a wider range of possible actions that are more complicated than those identified for the ET campaign and not currently carried out by a large number of people. It would also be worthwhile identifying which actions those making a pledge are already doing. The list of actions could contain two columns: one saying "I'm already doing this"; and the second saying "I pledge to do this"

> *"I mean a lot of the stuff I'd done, like insulating the house and turning the tap off when you're cleaning your teeth"*

(Interviewee 1)

"I think I ticked ones where I thought, well, I'm doing that anyway"

(Interviewee 3)

"But I was already doing them, you know. So I don't feel that I pledged to do anything"

(Interviewee 6)

Communications methods

This theme refers to all parts of the interviews where individuals commented on the different aspects of the campaign with which they had engaged.

Multiple communications

Several respondents stated that they had engaged with the ET campaign via more than one method. This shows that the campaign was broad-ranging, consistent and individuals could identify and connect the varying aspects of the project. This is important as one of the key goals of the project was to initiate a coherent campaign, so that residents of Nottinghamshire and Derbyshire could link the different communications and ET could be seen as a single point of reference for climate change information in the two counties.

"Well I've seen the website and went through it and pledged… and I've seen the displays that have been around, the bus"

(Interviewee 7)

"I've seen [the pledge bus] at the Ashbourne Show, I think there was one there… I've seen one somewhere else, I've seen one go past on the road, I've seen them about, sort of thing"

(Interviewee 8)

"I went on [the internet] to have a look at the website and it was being built, it was quite early days. Erm, then there was a van, came to Chesterfield…And also there was a time when you could go and make a pledge in the Town Hall"

(Interviewee 9)

Freebies

This theme is about how the interviewees perceived the free incentives offered by the campaign for people taking part in the communications; items such as energy saving light bulbs and devices to reduce the amount of water in the toilet cistern were given out when people engaged face-to-face

with ET. Most people who commented about this were positive about receiving a product that could help reduce their impact on climate change and people tended to state that they used the devices in their homes.

> *"I think people engage better when it's in their face. Especially when they're giving away free light bulbs or something, that'll draw a crowd. They'll get them in there; I think you've got to do that"*
>
> (Interviewee 8)

> *"…in your cistern, you can put in one of those low flush things…I mean I've moved to a new house now where it's small cisterns anyway, but where I was before, we put it in"*
>
> (Interviewee 9)

> *""There was a van there giving away those reusable bags, erm, with a light bulb in"*
>
> (Interviewee 10)

However, one interviewee, who was actually an employee of Derbyshire County Council, was negative about the use of incentives such as energy saving light bulbs or water saving devices as part of a social change campaign carried out in the workplace.

> *"I felt like I was just queuing up to get a free Hippo [device for saving water when flushing the toilet] and not actually really promising anything"*
>
> (Interviewee 6)

Website

There were a range of comments about the ET website. Some of the interviewees had viewed the website content and there were several positive, practical comments about it.

> *"I thought [the website] was alright. Fairly common sense to me"*
>
> (Interviewee 5)

> *"The website was quite easy to use – that's how to do it"*
>
> (Interviewee 8)

Campaign objectives and methods

As can be seen in figure 5.4, this theme, which covers the incidences where respondents refer to the campaign in general, is split into two middle order themes: those comments that are positive

about ET objectives and methods; and those comments that are negative. These two middle order themes are comprised of several lower order themes, which are discussed below.

Positive about campaign

Not preaching

Some of the interviewees commented that the campaign did not 'preach' to the target audience, something that would have caused them to turn off and possibly ignore the communications. Interviewees thought this a positive aspect of the communications.

> *"It seemed very much about what you can do, rather than all preaching 'this is what's happening and these are the causes and effects"*
>
> (Interviewee 9)

> *"I mean the pledge is something that, it's err, it's not in your face. It's sort of 'you come to us and fill it in', so I think that's good"*
>
> (Interviewee 10)

Working together

Several of the interviewees thought that the campaign really emphasised the broad-ranging nature of problems such as climate change and encouraged individuals to work together. People thought that the idea behind the whole project was to engender a belief that collective action was vitally important.

> *"[They're trying] to raise awareness and to show how easy it is to do little things that you might be doing anyway, but just to make you think about it. Yeah, to show how easy it is to make changes"*
>
> (Interviewee 3)

> *"It's nice to know that something's being done and some people are pledging to make an effort"*
>
> (Interviewee 5)

> *"I think they're just trying to get over the fact that it is down to individuals and they've got to, you know, do something about it"*
>
> (Interviewee 6)

One respondent pointed out that it would be very useful for the organisations funded by the campaign to attempt to match any effort given by the target audience. This, they thought, would really help push the message and get more people on board. This relates to the point noted in

section 5.2, that individuals state they are more likely to act if government – in this case local government – takes the lead on climate change.

> *"I mean it'd be nice if underneath [the pledge] it said 'you do that and Derbyshire County Council pledges to… And that's what we've done…' So that would be good. I mean Derbyshire could save a lot; switch all the lights off when they're not at work"*
>
> (Interviewee 7)

Local aspects

Two of the interviewees thought the fact that the campaign was targeted towards a specific geographical area was a positive aspect of ET.

> *"It was good that it was local, that it was saying 'this is what we can do in Derbyshire and Nottinghamshire'. And that's good because it brings it back to people"*
>
> (Interviewee 7)

This implied that they thought it might have more resonance with local people and could be discussed in context between friends.

> *"[referring to whether their friends would be interested in the website] well I'm touched by what's in there and I've found most of my friends seem to be on board doing it anyway. They've all done the same, yeah"*
>
> (Interviewee 1)

Secondary impacts

This theme refers to incidences in the conversation where the respondent suggested that they had passed on information about the ET campaign to other people, such as friends or members of their family. This is very important for localised campaigns such as this, as it maximises the number of people reached and raises awareness of both the campaign itself and the issues that are addressed by the communications.

"I think most of the things I pledged were sorting the missus out… my pledge was to make other people aware of the pledges and get them to do stuff" (Interviewee 5).

"[I've discussed the campaign with] the guys in the office [and] probably my partner at home" (Interviewee 9).

"I'd already done [the pledge], my wife did the pledge at the van" (Interviewee 10)

Backs up current views

Several interviewees mentioned that the information they received through the campaign backed up what they already knew or felt about climate change. All those who mentioned this theme were positive about carrying out amelioration activities. Therefore, in addition to raising awareness about climate change, the ET project also cemented people's views about the issue.

> *"Nothing's going to change my mind about those sort of things, because there's no point in pouring gallons of water down the plughole, the waste. That's incontrovertible, there's no point wasting stuff, natural resources included"*
>
> (Interviewee 1)

> *"I think most of it was stuff that we'd already had covered or was common sense to me"*
>
> (Interviewee 5).

Negative about campaign

Not a balanced view

A few respondents thought that the views expressed by the ET campaign were not balanced and not enough information was given about the counter-argument that climate change is not actually happening. They thought a more balanced view would be more appropriate. The interviewees that noted this were mainly those who were sceptical about the existence of climate change.

> *"Well they're trying to raise awareness by getting everybody to talk about it, if you like, you know, get everybody thinking about it by putting all this information – they call them 'facts' – in your face about different things. But there's nothing, it's all pro-climate change, which you would expect it to be"*
>
> (Interviewee 2)

> *"I would have liked to see each side of it to get a balanced view"*
>
> (Interviewee 6)

Short timeframe for impact

Some of the interviewees stated that the communications only actually impacted on them for a short time. For instance, one individual could not remember ET at all despite making a pledge, whereas others stated that they only really thought about the project for a little while after engaging with it.

> *"I thought [the pledge] was a bit of fun really and didn't really… it made me think about it for ten minutes and then… I was sent an email straight after confirming my pledge, which I read and deleted, and that was it"*
>
> (Interviewee 3)

"[When did I engage] with this campaign? I really can't remember. The last few months? I have no idea"

(Interviewee 4)

"I don't give that campaign a second thought, to be honest, you know"

(Interviewee 6)

However, one respondent did think that the reminders sent by the campaign were important.

"I think it's a fairly good campaign. It's making people aware all the time, there's plenty of emails and reminders that come round about it to keep it in the forefront of people's minds"

(Interviewee 5)

Don't know who to trust

This theme is not directly related to the campaign itself, as most interviewees did not state that they did not trust the information that they received from ET. However, it highlights the importance of using trusted communication channels when attempting to influence individual's attitudes towards climate change. The fact that interviewees mentioned a lack of trust in some institutions, such as central government and science, but tended to not question the information supplied by the ET campaign suggests a key role for Local Authorities in climate change communications.

"You don't know who to trust on it. You don't know who is right and who is wrong. That's why I take the view I do. I just don't trust them"

(Interviewee 2)

"That's the problem, because there's so much conflicting information. Some scientists say one thing and some scientists say completely the opposite. It's hard to know whether it's worth doing anything"

(Interviewee 3)

5.3.3 Template analysis of data from 'Wellingborough Toolkit'

There were several themes evident from the analysis of the ET interviews and a tree diagram of the codes is shown in figure 5.5. As with the template analysis of the ET interviews, data have been placed into 'higher' and 'lower' order themes. The results are organised and described below, first of all, by the higher order theme. This is followed by the lower order themes, an explanation and example quotes to illustrate the themes content.

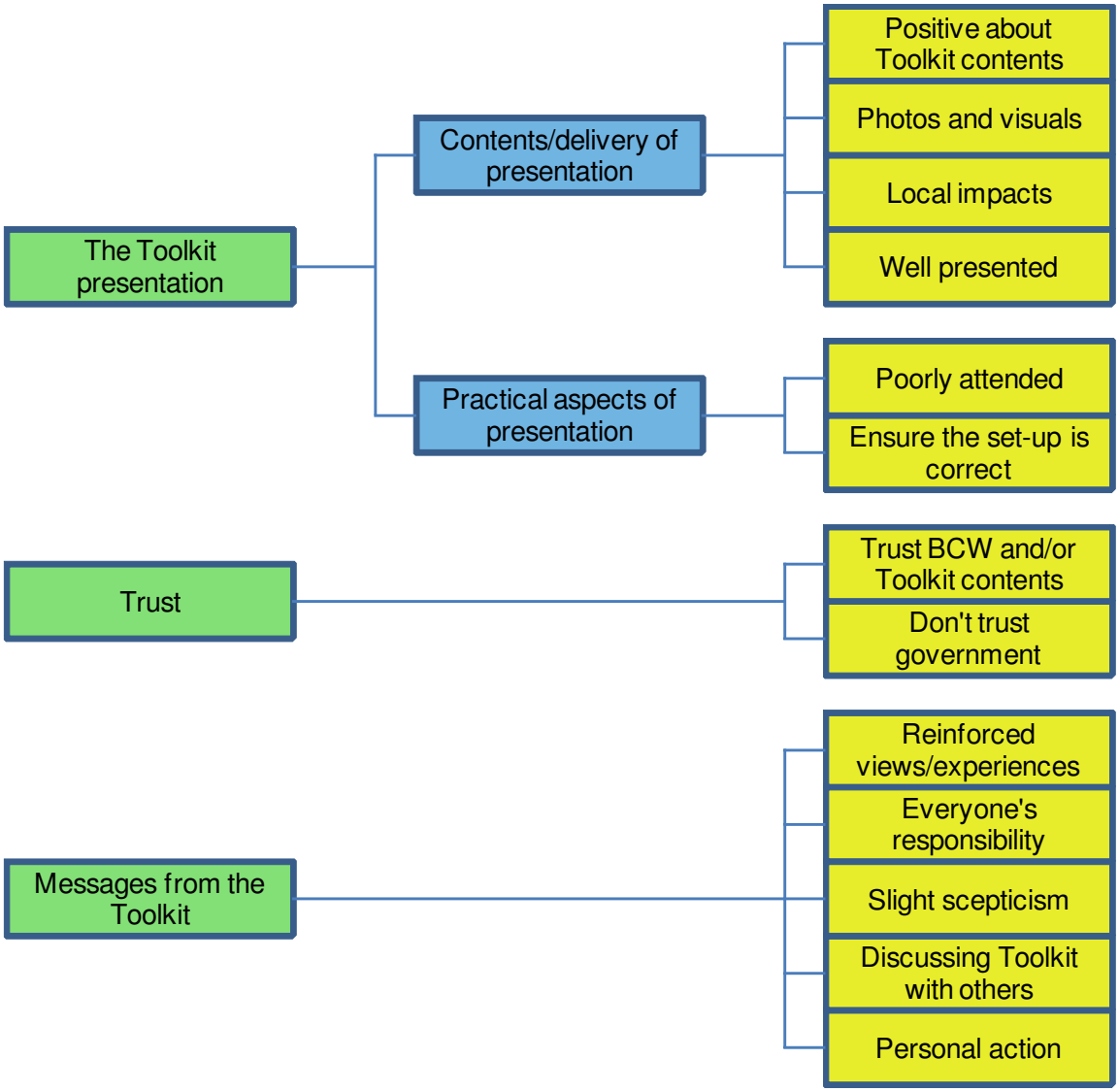


Figure 5.5: Category tree diagram showing the themes identified from the WT interviews

The Toolkit presentation

This higher order theme refers to all the incidences in which the interview respondents referred to the actual contents of the Toolkit presentation or commented on the process of attending. The theme is split into two middle order themes which relate to the actual contents of the presentation and the practical aspects of the delivery.

Contents/delivery of presentation

Positive about Toolkit contents

Most participants stated at some point in the interview that they thought the contents of, or ideals behind the Toolkit were positive. There were a range of comments, from the general to the specific, which suggested that the participants enjoyed attending the presentation and that they agreed with the sentiments behind it.

> *"It was really very good"*
>
> (Interviewee 1)

> *"It was very good. Yeah, it was very good"*
>
> (Interviewee 2)

> *"I enjoyed it all. In fact, it was one of the most enjoyable presentations I have been on"*
>
> (Interviewee 6)

Photos and visuals

Several respondents referred specifically to the pictures and visual aids that were included in the Toolkit presentation. These included photo mock-ups of the local area that showed what might happen if the impacts of climate change were to hit Wellingborough in the future. For example, photos were edited to show a tornado behind the local theatre and vineyards on local arable land. There were also photos of flooding that had previously occurred in the area. All respondents who included this theme considered the visuals a positive aspect of the presentation. This shows the importance of bringing climate change impacts down to a local level and actually showing a visual representation of how impacts could occur locally.

> *"I think that's quite good, something visual… they did the Castle Theatre [with a mock-up tornado behind it]"*
>
> (Interviewee 1)

> *"There were shots of farming scenes, international arctic scenes. We covered an entire worldwide perspective"*
>
> (Interviewee 3)

> *"There were a couple of photographs that had been taken when we had the floods in 1980 that they included in the slide show and that was pretty good"*
>
> (Interviewee 4)

Local impacts

Several of the respondents thought the presentation benefited from the fact that climate change impacts were brought down to a local level. By showing people what might happen in their immediate locality, the existence of climate change seemed more real.

> *"Wellingborough Council…provided a PowerPoint presentation for us on the climate change and how it could affect the local area"*
>
> (Interviewee 4)

> *"[I understood it] because it was mostly around the local area"*
>
> (Interviewee 6)

However, there were some respondents who did not actually think or remember that local impacts were included in the presentation.

> *"That's what, in a sense, surprised me. There we were with the Parish Council and there was nothing pertinent to the area locally at all"*
>
> (Interviewee 3)

> *"I think it was more [the wider impacts]. I think it was more international"*
>
> (Interviewee 2)

Well presented

Some of the participants specifically mentioned that the person who presented the Toolkit to them (a BCW Officer) did a great job. It seems reasonable to assume that this added value to the contents of the presentation.

> *"She came and showed a film which was on the different weathers and things like that…she was very good"*
>
> (Interviewee 2)

> *"The lady who was doing it with her PowerPoint projector was extremely good, as was the content of her presentation. It really was very, very good indeed"*
>
> (Interviewee 3)

Practical aspects of presentation

Poorly attended

Two respondents mentioned that the presentation that they went to was poorly attended and could therefore have had more of an impact if more people had been there. For future interventions, it may be worthwhile maximising the amount of people taking part and only carrying out the communications if a requisite number are willing to turn up.

> *"Not many people turned up"*
>
> (Interviewee 2)

> *"When it came to the presentation – very poorly attended – two Parish Councillors and two other people were there"*
>
> (Interviewee 3)

Ensure the set-up is correct

Two respondents highlighted an important point regarding the delivery and content of the presentation. They suggested that it should be ensured that all attendees could actually receive the communications and that they should not be overwhelmed with scientific facts. Just as a good presenter adds value to the contents of the presentation (as noted above), poor logistics may impact negatively on the communications.

> *"To be honest it was a bit difficult, because the way they had it set up was like, it was a bit echoey, and because we sort of sat with ourselves back a bit, which was silly really because that didn't help us with my wife having a bit of trouble with her hearing…"*
>
> (Interviewee 2)

> *"I mean the first part was perhaps more figures and percentages, which sometimes went in one ear and out the other"*
>
> (Interviewee 7)

Trust

This higher order theme reflected the fact that respondents talked about who they trusted in relation to climate change information. People generally believed what they heard in Toolkit presentations (carried out by local government officers) and tended to not trust central government in relation to these issues. This bodes well for any similar, future initiatives carried out at local governmental level and implies a key role for councils in communicating climate change.

Trust BCW and/or Toolkit contents

"[I believe everything they said] without question. Because I feel that they've looked into it more than I would, you know, and have more insight into these things"

(Interviewee 1)

"I mean, [the presenters] say you'll have great storms and floods and that, well you see that so you know that's true, don't you?"

(Interviewee 2)

"I absolutely, one hundred per cent, believed this woman"

(Interviewee 5)

Don't trust government

"The national [government] don't tend to show the whole picture, I don't think. They tell you the bits they want you to hear and not necessarily the bits that you need to hear"

(Interviewee 1)

"I think the government sometimes undersells, you know, for political reasons probably"

(Interviewee 5).

Messages from the Toolkit

This higher order theme encompasses all the incidences where the interviewees talked about what information they received through the Toolkit, or what messages they took away from the presentations.

Reinforced views/experiences

This was a common theme amongst the seven participants and related to the fact that many attendees thought that the contents of the presentation backed up the views they already had or supported the information they had previously received about climate change. This is a positive finding as people are more likely to take interest if they receive consistent information.

"[It was] stuff I knew about, a lot of stuff I had read about – nothing new, but still enjoyable"

(Interviewee 4)

"And she showed us picture of the flooding and we know all this anyway"

(Interviewee 6)

"[The presentation] reinforced what I'd heard before, really"

(Interviewee 1)

Everyone's responsibility

One encouraging message that the interviewees thought the Toolkit was trying to convey was that it was everyone's responsibility to act on climate change and that people should work together to reduce their impact.

> *"[They were trying to convey] that all the residents of the borough need to be aware of the change and to pull their... to do their part in regard to recycling"*
>
> (Interviewee 3)

> *"I think that was what she was trying to get across – just in doing little things, everybody can help"*
>
> (Interviewee 7)

Slight scepticism

Even though the interviewees were generally positive about the Toolkit contents, and about climate change in general, some still acknowledged that they were, as non-experts, not in a position to challenge the scientific evidence presented.

> *"I haven't got access to all the evidence so I won't say that I 100% agree with all the facts and figures [in the Toolkit], but on the other hand, I've got no reason not to believe it"*
>
> (Interviewee 4)

> *"Well I've got no reason to doubt [the information in the Toolkit]"*
>
> (Interviewee 7)

> *"I had no reason to question [what I was told], but I don't know enough about it"*
>
> (Interviewee 2)

Discussing Toolkit with others

Several respondents stated that they had discussed the presentation with other people, giving the communications a secondary impact.

> *"We did [discuss the stuff I saw] on the day between ourselves and I did with my neighbour, you know, afterwards"*
>
> (Interviewee 1)

"[I discussed it with my husband. He was definitely interested. He's very much into anything living really"

(Interviewee 5)

Personal action

After viewing the Toolkit presentation, several respondents thought that there were many things that they could do personally to help mitigate climate change. This is vital as, even though attitudes are one important pre-cursor of behaviour, human actions are ultimately responsible for reducing impacts on the climate.

"Just in doing little things, everybody can help"

(Interviewee 7)

"There are positive things that we can do on a personal level to help"

(Interviewee 1)

5.3.4 Research question 5 – key findings

5.3.4.1 Key findings from ET interviews

This qualitative analysis produced fourteen lower order themes, which encompassed what the ten interviewees thought about the campaign. As can be seen from the discussion of each theme, above, there were several encouraging aspects about the campaign and, as such, several recommendations that can be made for future interventions. The analysis also revealed some negative opinions about the communications. Again, this information is useful for suggesting methodologies for future initiatives.

- Making a pledge to change behaviour felt good to the interviewees and hard figures of associated carbon savings gave them a worthwhile measure of the usefulness of their actions. However, it was evident that some people found the actions too simplistic or they were already doing them. Future campaigns involving a pledge would need to ensure the right balance between ease and difficulty of behaviours, in order to challenge, but not alienate, the targets of the communications. Future campaigns could include two columns next to the potential actions on the pledge form; participants can then note whether they are already doing the actions, or if they pledge to carry out 'new' actions in the future.
- Some interviewees engaged with the campaign through multiple communications channels, which ensured a coherent message was provided. This included positive comments about the campaign website, which provided simple information and was easy to use.

Furthermore, it was noted that some interviewees had further discussions about ET with other people, increasing the number of people that were engaged by the project.

- The free items handed out when people engaged with ET were generally considered positive and it was evident that this attracted people to engage with the campaign in the first place. The fact that some people installed the items they received from ET (the water-saving devices for toilet cisterns), meant that energy- and water-saving was actually implemented by some people.
- The fact that the campaign was local, that it emphasised the collective nature of climate change and did not preach to the target audience was considered positive. Several interviewees also noted that the information they received from ET backed up their current views. This research has also shown that it is important that climate change information is received from a trusted source and that interviewees tended not to trust central government. The fact that ET was carried out by local government, and the information supplied was generally trusted, implies an important role for local government in future initiatives.
- Some individuals expressed concern that insufficient space was given to an alternative or sceptical argument about the existence of climate change.
- The actual impact on some of the people engaged by ET was questionable, given that some interviewees stated that the impact of the communications only occurred over a short timeframe. This is not surprising given that the target audience was over two million people, which meant that the resource (e.g. time or money) available for communicating with each individual was relatively low.

5.3.4.2 Key findings from WT interviews

The qualitative analysis of WT data produced thirteen lower order themes, which encompassed all the issues that were discussed by at least two interview participants. The themes cover the range of opinions shared by the people who were interviewed. Key findings are listed below and practical recommendations for future communications are suggested.

- Interviewees tended to enjoy the presentations they took part in, suggesting that this approach is appropriate for the target audience of community group members. A particularly important aspect of the communications was the visual representations of potential climate change impacts at local level. These tools allowed the interviewees to see how impacts may manifest in places they lived or knew and could easily be used for future interventions or tailored to different localities.

- People also tended to trust the information in the Toolkit, which was presented by officers from a local government, more than they would information from central government. This should feed into future initiatives as it suggests climate change communications are more likely to be successful if they are initiated at a local level and presented by local councils.
- From a practical point of view, it is important to ensure that there are sufficient recipients of the communications to reduce costs in terms of time and money. It is also essential that those individuals who attend are able to fully take part in the activities, as it detracts from the message being delivered if there are practical reasons why individuals cannot get fully involved.
- The person presenting or carrying out the communications played an important role in how the recipients perceived the information. Future interventions should ensure that the communicator is well-informed and able to get their message across to the audience.

5.3.5 Research question 5 - discussion

The template analysis provided several observations and the main output from the analysis is in relation to recommendations for future interventions. ET interviewees noted that making a pledge to change behaviour felt good, highlighting the usefulness of a pledge as a tool in its own right for helping to engage people with communications initiatives. A further benefit of pledging is that it likely to create a moral obligation to act, which is a powerful contributory factor to ESB (Whitmarsh, 2009a). Findings from the WT interviews suggested that the visual aids showing potential local impacts of climate change (such as a tornado over the local theatre) evoked a strong emotional response amongst WT interviewees and this aspect of the communications was often the key message people took away. Similarly, Spence & Pidgeon (2010) found that photomontages and imagery were powerful climate change communications tools.

The results discussed above accord with the contention expressed by Pooley & O'Connor (2000) that interventions for changing ESB should target affective responses to climate change. Practically, any interventions involving making a pledge should ensure that the actions that subjects can commit to are sufficiently difficult to actually make a difference (but not too difficult so that the recipients of communications are unable to commit to the actions). Devine-Wright et al's (2004) contention that interventions are more likely to change attitudes if they address the situation in which behaviour occurs and show people how the issue will impact on their everyday lives is also supported. An additional strategy to reduce overall carbon emissions may be to target particular behaviours that have high energy outputs, creating bigger reductions (Whitmarsh, 2009a).

Results from both case studies identified a key role for local government in climate change communications, as they tend to be trusted more than central government. This provides further evidence that the technique of devolving communications in the UKCCCI (Futerra, 2005[a]), to organisations such as local councils, was appropriate and that future initiatives may be more successful if they follow a similar rationale (Collins et al, 2003). The ET interviews highlighted that some people engaged with the project through several channels and found the coherent message important. Research by Pruneau et al (2003) found that understanding of climate change was improved by using a range of different learning tools and the findings of this study support this. If future communications have sufficient time and funding to use multiple channels, they should find positive results in terms of increases in knowledge.

The ET interviews found that the long-term impact of the communications was, in some instances, questionable and only affected the recipients for a short time. Pooley & O'Connor (2000) and Uzzell (1999; 2000) suggest that this short-term impact on attitudes, knowledge and awareness is unlikely to engender the positive outlook needed for long-term behaviour change. Similarly, Abrahamse et al (2005) advocate regular feedback on actions taken to mitigate climate change. Future interventions must ensure that the changes they are trying to engender are maintained over a long period, but this may be difficult for initiatives that receive funding for a project with a limited timescale, such as those funded by the UKCCCI. Methodologically, the scope of the present study did not allow this to be modelled. A longitudinal study, which looks specifically at how to ensure communications have a lasting impact (i.e. by making the behaviours habitual), could provide the necessary insights to make recommendations about how to ensure lasting change in perceptions.

5.3.6 Conclusions – research question 5

In conclusion, the template analysis has helped to display what the sample of twenty interviewees thought specifically about the two communications projects that they took part in (the Wellingborough Toolkit and Everybody's talking about climate change) in a coherent manner. The results showed that there were both positive and negative conceptions of the two interventions. This analysis has therefore provided practical recommendations for future projects based on insights into how recipients of communications actually perceived the interventions they had taken part in.

6. Conclusions

6.1 Introduction

The research reported above was based around three case studies of climate change communications projects, funded by Defra's UK Climate Change Communications Initiative (UKCCCI) to alter climate change-related perceptions. Data were analysed using quantitative and qualitative methods and the results were reported in chapters four and five. This was followed by a discussion of the implications of the results in relation to the literature highlighted in chapter two. The overall aim of the research was to identify appropriate communications methodologies and make recommendations for future initiatives.

Specifically, the research included a survey of the perceptions of residents of Nottinghamshire and Derbyshire (N&D) who took part in the case study project 'Everybody's talking about climate change' (ET). The descriptive statistics were compared with a nationally representative survey, which used the same questions to see if responses differed. Additionally, N&D residents responded to a six-item scale which was analysed by individual item and also combined to obtain a single measure of climate change worldview. Results for all questions were compared across different socio-demographic groups (age, gender and county of residence) to discover if there were any statistically significant differences between groups. Additionally, 'before' and 'after' survey results from two further communications projects – the 'Wellingborough Toolkit' (WT) and C-Change - were compared to see if attitudes, knowledge and awareness had changed over the course of the communications.

Qualitative data were also collected and analysed; interviews were conducted with twenty recipients of climate change communications – ten who took part in the ET communications and ten who took part in the WT communications – to assess their perceptions of climate change. Interviewees were also asked what they actually thought about the interventions they had taken part in to discover what they thought about the projects.

Chapter 6 summarises the key findings of the research in relation to the five specific research questions posed in chapter one, and also in relation to the overarching aims of the thesis. The practical, methodological and theoretical implications of the study findings are also discussed here and possible directions for future research are explored.

6.2 Conclusions and future research avenues – research aim 1

According to the findings from the sample of 20 interviewees, people tend to think about climate change in terms of six major themes. Some individuals organise their thoughts around a small

number of themes, whereas others draw on all six themes in their cognitive maps. This suggests that knowledge structure varies across individuals, but there were some commonalities - certainly in terms of specific concepts - across the majority of interviewees. Overall, there is a very high awareness of climate change across the participants and some very in-depth knowledge of certain subjects. Particularly, awareness of potential physical impacts of climate change and behaviours to mitigate climate change is high throughout the population. This suggests that general, low-level awareness-raising is something that may no longer be needed for future interventions. Therefore, future policies to support behaviour change should concentrate more on enabling people to act on climate change rather than supplying information to increase awareness.

This study explored knowledge of climate change amongst individuals who had taken part in two different attitudinal interventions. Little specific difference was found in the cognitive maps of these two groups of people and the interventions themselves were not generally included in the cognitive maps (only one interviewee directly mentioned the intervention they had taken part in). This is unsurprising because, as this study has shown, people have a wide knowledge of many aspects of climate change and they obtain information from a wide range of sources.

A potential problem with the qualitative research is that, as there was no incentive to take part, individuals who responded to the request to be interviewed may be more interested in the subject of climate change than the average person. They may also adopt more environmentally-friendly behaviours in their everyday lives and be keen to share this with the researcher. This represents a possible bias in the results and potentially effects the subsequent conclusions. However, the methodology used was subject to some constraints as it had to be designed to fit in with the communications projects around which the research was based. A future quantitative study looking at climate change knowledge and using a robust sampling methodology and a large sample size would complement the present research and provide triangulation of the results. Some of the findings of this study could be used to provide questions for a large-scale questionnaire survey. It could consider, for example, whether the wider population of the UK still confuse ozone depletion and climate change or it could test what knowledge people have of climate change adaptation issues. The study has also produced a list of representative concepts that can easily be used for a structured 3CM study of climate change knowledge.

The quantitative analysis conducted under research aim 1 compared perceptions at the national and local levels. The results showed that perceptions differ at national and more local levels and that the approach adopted for the UKCCCI was an appropriate one. For example, knowledge about energy-related carbon emissions was much lower amongst the local population. Indeed there is

evidence, discussed below, which supports further devolution of climate change communications to a group, or even individual, level. The perceptions of people living in different geographical areas vary as the context in which they live their lives varies. This result is therefore unsurprising, but the research has analysed empirical data to show that this is the case. Practically, this suggests that future campaigns and initiatives should adopt a policy of devolution of communications. The entire dataset of responses for the national survey conducted by COI (2006) was not available for the present study so it was not possible to test the statistical significance of the identified differences in perceptions. Future research could collect empirical data specifically for this purpose and could compare the perceptions of different regional or local populations to each other, and to national averages, to provide more robust conclusions.

6.3 Conclusions and future research avenues – research aim 2

An important finding from the before-after surveys of the case study communications projects is that, if designed and implemented correctly, interventions can alter perceptions of climate change. This was reflected by the number of positive statistically significant differences in perceptions before and after the C-Change project compared to the other two case studies. It would be interesting to look into how age affects susceptibility to communications around climate change. As noted above, the results have indicated that the C-Change project was the most effective in terms of changes in perceptions, but to what extent is this due to the fact that the target audience were younger than for the other projects and therefore in an earlier stage of development in terms of their attitudes, knowledge and values? This could be studied by considering a single intervention that targeted all age ranges and then using an age variable as a covariate in a 'before-after' analysis. This would add value to future communications initiatives by helping to show the true worth of any changes in perceptions.

This quantitative analysis of perceptions before and after the interventions and the in-depth analysis of data from the Everybody's talking about climate change campaign has shown that awareness of climate change is high throughout the country, as in both the national survey and the ET, WT and C-Change project surveys most respondents were aware of the issue. In light of the information deficit model of behaviour change (Bulkeley, 2000), which implies that by supplying information about the problem of climate change you can change perceptions and then behaviours, this suggests that awareness-raising is unlikely to impact on climate-related behaviours. Stern's (2000a) framework of environmentally-significant behaviour (ESB) suggests that there are a range of pre-cursors to ESB, which can be divided into four broad categories. It is suggested that positive ESB is made more likely by making each of the pre-cursors more favourable (Ibid.; Halpern et al, 2004). The results noted above imply that awareness of climate change is high enough in the UK

that money would be better spent attempting to make the other pre-cursors of behaviour more favourable. This includes both other psychological variables, personal capabilities and contextual issues.

Analysis of the N&D dataset has shown that there are significant differences between the perceptions of socio-demographic groups within a given target audience and that this warrants a varied approach to communications. A key point regarding communications is that segmentation of publics into groups, whether it is via socio-demographics or attitudinal variables, is an ongoing and iterative process. As the statistics presented from the N&D survey have shown, perceptions of climate change vary by socio-demographic group, but they also vary in time. Reflecting on the four typologies of opinions on climate change identified by their factor analysis, Lorenzoni & Hulme (2009, 394) point out, "it is plausible that the evolution of knowledge, understanding, beliefs and policy on climate change could over time either invalidate these typologies or alter the proportions of individuals in each typology". An important recommendation for future initiatives is to ensure communicators know their target audience and this can only be achieved by updating segmentation models on a regular or project-by-project basis. Despite the fact that the UK Climate Change Communications initiative (UKCCCI) did devolve communications to communities of place or interest, target audience segmentation via attitudinal, behavioural or socio-demographic variables was not employed either at initiative level or at individual project level. The results reported here indicate that gathering intelligence on which perceptions it would be worthwhile influencing may have increased the likelihood of any changes in perception.

Some of the conclusions drawn from the quantitative study are not as statistically robust as they could potentially be, given that the two samples had to be surveyed before and after the case study projects and it was not logistically feasible to track perceptions of individual recipients of communications. Additionally, it was not possible to isolate the effect of the interventions from wider sources of information on climate change. Given its scope, peer-reviewed evaluation of the UKCCCI was worthwhile and the techniques chosen here – comparing before and after samples of people receiving communications using between samples statistical testing – represented the best available methodology for evaluating these three case study projects. However, a longitudinal questionnaire study of individuals who take part in large-scale climate change communications campaigns would allow more robust conclusions to be drawn about the success or failure of certain methodologies. However, this would be expensive in terms of time and cost as people would have to commit to taking part in the research over a period of time. Action research, where the evaluation of the communications is carried out by the communicators themselves (Robson, 2002),

may represent the best tool for this type of study as those implementing projects have unique access to the recipients of communications.

6.4 Conclusions based on results from both studies

Overall results from the various analyses conducted for this thesis provide empirical evidence that climate change communications are more likely to be successful if they are tailored as much as possible to individuals. The 3CM study showed that people tended to talk about climate change in terms of their existing knowledge structures, which are highly personalised. Similarly, perceptions were found to differ between socio-demographic groups within a given target audience for a single communications campaign, suggesting that varied communications are required to carry out effective projects. Practically, peer education interventions which are designed to operate on a more individual-to-individual basis, have been shown to be the most effective intervention type in terms of statistically significant differences. Such a methodology is likely to be more expensive, as shown by the cost comparison per individual reached for each case study project. A key finding is that it is worthwhile spending a greater amount of money or resource to communicate with fewer individuals if it is more likely to produce the desired outcomes in terms of significant changes in perceptions. Defra's policy of devolving communications to communities of place or interest for the UKCCCI is a notable step change in government policy (Collins et al, 2003), but this research makes a case for further devolution to a group or individual level.

The source of information in a climate change communications campaign is important as people tend to trust certain groups or individuals more than others. This has been shown in the results of the before-after analyses, where peer education proved to be the strategy most likely to engender positive perceptions. The 3CM and template analyses showed that government, industry and businesses tended to be mistrusted whereas local government, friends and family were trusted. Practically, this implies a large role for local authorities and charity organisations such as the Woodcraft Folk in future interventions. Furthermore, both the 3CM study and the before-after surveys showed that many people consider the government and industry and business the most important players in mitigation efforts, but that individuals and communities are also considered to have a role. It was noted by Futerra (2005a) that by making the psychological variables that contribute to ESB more favourable, the public might find changes in context more agreeable (e.g. changes in legislation, carbon taxes etc.). The results of this research suggest that the current state of public attitudes, awareness and knowledge may support such an approach. Given that the UK government has year-on-year climate change targets under the Climate Change Act 2008 (DECC, 2009), this is a key finding which supports future changes in legislation or other government-created contextual changes.

Based on the template analysis and the latter part of the quantitative study, where attitudes were compared before and after the interventions, a number of practical recommendations were made for future climate change communications projects. What does and does not work practically in environmental communications is the subject of great debate in the literature (e.g. Bulkeley, 2000 Devine-Wright et al, 2004) and there is much information to draw on for general environment-related projects. There are many fewer studies specifically looking at climate change and the insights from this research can easily be applied to future small-scale projects by scheme administrators. Wider governmental policy initiatives in the UK can also draw on the conclusions of this study; for example, if Defra commissioned a further Climate Challenge Fund or similar that funded projects that attempted to impact on climate change-related attitudes and knowledge, they could specify that programmes receiving funding followed the practical recommendations made here. Defra could also specify that the climate change worldview scale developed here had to be used before and after the interventions to monitor any changes in worldview over the course of the communications. This would allow a comprehensive dataset to be developed that could be analysed in-depth by academic researchers with the goal of producing the internally consistent scale mentioned above.

One of the most important conclusions appears to be in relation to the design of communications initiatives that can make significant changes to individuals' perceptions of climate change. All of the results reported here support the approach adopted by Defra of devolving communications to lower levels in order to effectively target different communities (either geographically or communities of interest). Once this devolution has taken place, it may be tempting to try and influence as many people as possible and achieve value for money in terms of the number of people reached (for example, as the ET campaign tried to influence the entire population of two counties, some two million people). This research suggests that such a method, which may in some cases be driven by the desires of those receiving funding to present favourable end-of-project statistics to the funders, may be counter-productive. The two projects – ET and WT – that concentrated on reaching larger audiences and spent less money and effort per person engaged produced some indifferent results (i.e. some perceptions became more positive and some became less positive post-communication), whereas the project that focussed on fully engaging individuals via peer education produced more significant changes in perceptions. Such a conclusion may seem intuitive and further empirical research could explore how the amount of time a person engages with a project affects attitude and behaviour change. This could involve, for example, using the same communications material for a number of people but varying the amount of time a subject engages with it.

6.5 Impacts of research

Results, analysis and conclusions from this thesis have formed the basis for two outputs that have been subject to peer-review: a conference paper was presented at the 2008 International Association of People-Environment Studies (IAPS) Conference in Rome (White, 2008; the presentation is shown in appendix 4); and an article was published in the journal *Local Environment* (White & Wall, 2008; the paper is presented in appendix 5). In addition to being an academic study, the evaluation in this thesis was also presented to Defra as three evaluation reports on behalf of the three case study projects. Furthermore, the researcher was involved directly with Defra to inform the wider evaluation of the UKCCCI and conducted a presentation to staff members from all the projects funded by the Climate Challenge Fund to instruct them on how to evaluate their own communications initiatives. Consequently, this research fed directly into Defra policy as the lessons learnt from the evaluation of the UKCCCI informed Defra's latest initiative, the 'Greener Living Fund' (Defra, 2009).

The research also influenced the work of each of the partner organisations. The Woodcraft Folk's 'Face your elephant' tent (which was one of the communications used by C-Change) received Knowledge-Transfer Partnership (KTP) funding from the Engineering and Physical Sciences Research Council to develop the communications methodology and resources and tour further events and shows. The evaluation in this thesis fed directly into this development. 'Everybody's talking about climate change' decided that any future campaigns involving pledges would include a broader range of actions and used the recommendations highlighted here to inform further bids for funding. The Wellingborough Partnership continues to use the toolkit for engagement and awareness-raising events and have made some modifications to the content based on this evaluation.

6.6 Summary

To conclude, there are several important theoretical findings that have been made from the various analyses conducted here. The research has identified what perceptions the research group have in relation to climate change and shown that they can be categorised into six broad categories. It has also shown that people are highly aware of climate change and tend to display lay knowledge of the issue, rather than detailed scientific knowledge; this is largely expressed through the identification of climate change impacts and mitigation behaviours. The interviewees that took part in the qualitative research had a broad understanding of the physical impacts of CC, but were less aware of societal impacts. Additionally, they did not tend to talk about adaptation to climate change; rather, their perceptions of the issue were framed around mitigation. Descriptively, perceptions were found to differ between national and regional samples and also at a statistically significant

level between socio-demographic groups within a single target audience for a communications project. Finally and most importantly for future initiatives, the research has shown that, if designed and implemented correctly, communications can have a significant, positive effect on people's perceptions of climate change. It appears that positive results, in terms of changes in perceptions, are more likely to be engendered if more time and money is spent per individual reached.

Many of the key practical implications of the study follow on from the theoretical findings noted above, and involve applying the theoretical insights made from the research to future communications programmes. Projects do not need to raise awareness or knowledge of climate change and instead should emphasise human-related impacts, adaptation issues and the role individuals can play on a personal level. Impacts should be brought down to the local level, via the use of imagery and photomontages, so individuals can relate CC to their own lives. The qualitative study found few sceptics of climate change, which suggests that such people should be ignored in future interventions and time and effort should be concentrated on the people that are ready to embrace pro-climate behaviour. Different interventions are likely to work for different individuals, which supports the policy adopted by Defra for the UK Climate Change Communications Initiative. Indeed the results suggest that future interventions may even devolve communications further than seen in these case study projects. The results support the use of peer education and work-based initiatives as colleagues, friends and peers tend to be trusted more than the government or the media. Finally, the research results suggest that society have sufficiently positive perceptions that they may be willing to accept contextual changes that would aid behaviour change.

This thesis has also made a methodological contribution to the existing body of research on climate change perceptions and communications. Conceptual Content Cognitive Mapping has been applied to a macro-scale issue for the first time, and climate change perceptions have been studied using a novel research methodology. The 3CM research has also produced a list of concepts that can readily be applied to a structured 3CM study without modification. The need to track the perceptions of individuals before, during and after specific interventions has been identified to provide more robust conclusions about the effectiveness of different methodologies. A first attempt has been made at defining an internally consistent scale that taps worldview in relation to climate change and this can be used as the basis for future research. Overall, the thesis has combined a quantitative and qualitative analysis of climate change communications to produce conclusions about how best to carry out future projects; previous studies have broadly used either one or the other techniques.

This research has made practical recommendations for future climate change communications projects. However, sufficient responses at individual level have so far not been made. There is also a changing political context in the UK with the government having legally-binding, year-on-year emissions reductions targets under the Climate Change Act 2008. The results reported here justify governmental interventions that change the context in which climate-related behaviour operates, such as carbon taxes or more stringent legislation, as the perceptions of the research subjects reported in this thesis are cognisant with such an approach.

With the growing salience of climate change as a political and social issue and the likely increase in societal and physical impacts, there will be a constant need to monitor changes in attitudes and knowledge and design behaviour change initiatives accordingly. This research looks at current understanding and considers what techniques are likely to work at this moment in time in the UK. As time goes by and the context changes, further data will need to be collected to ensure best practice. By dedicating resources to changing climate-related behaviour and basing practical initiatives on up-to-date and best available evidence, the UK government can facilitate the action needed to meet their targets and help prepare the population to become citizens of the low carbon economy.

References

Abrahamse, W., Steg, L., Vlek, C. & Rothengatter, T., 2005. A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology*, 25, 273-291.

Ajzen, I., 2002. 'Attitudes'. *In* R. Fernandez Ballesteros, ed. *Encyclopedia of psychological assessment*. London: Sage Publications, 110-115.

Ajzen, I., 1991. The Theory of Planned Behaviour. *Organizational Behavior and Human Decision Processes*, 50, 179-211.

Alabastar, T. and Hawthorne, M., 1999. Information for environmental citizenship. *Sustainable Development*, 7 (1), 25-34.

AllPsych, 2004. *Psychology Dictionary* [online].
Available at: http://allpsych.com/dictionary/c.html [accessed 11 February 2008]

Amtmann, L., 1996. *Stakeholder perceptions on wild and scenic rivers: a new cognitive tool for enhancing participation*. Unpublished MSc thesis, University of Michigan.

Andersson, B. & Wallin, A., 2000. Students' Understanding of the Greenhouse Effect, the Societal Consequences of Reducing CO_2 Emissions and the Problem of Ozone Layer Depletion. *Journal of Research in Science Teaching*, 37 (10), 1096-1111.

Antilla, L., 2005. Climate of scepticism: US newspaper coverage of the science of climate change. *Global Environmental Change*, 15, 338-352.

Austin, D.E., 1994. Incorporating cognitive theory into environmental policymaking. *The Environmental Professional*, 16, 262-274.

Ballantyne, R. & Packer, J., 2005. Promoting environmentally sustainable attitudes and behaviour through free-choice learning experiences: what is the state of the game? *Environmental Education Research*, 11 (3), 281-295.

Baron, J., 2006. Thinking About Global Warming. *Climatic Change*, 77 (1-2), 137-150.

Barr, S., 2006. Environmental Action in the Home: investigating the "value-action" gap. *Geography*, 91 (1), 43-54.

Barr, S. and Gilg, A., 2006. Sustainable lifestyles: Framing environmental action in and around the home. *Geoforum*, 37 (6), 906-920.

Bengston, D.N., 1994. Changing forest values and ecosystem management. *Society and Natural Resources*, 7 (6), 515-533.

Bostrom, A. and Lashof, D., 2007. Weather or climate change? *In*: S.C. Moser and L. Dilling, eds. *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*. Cambridge: Cambridge University Press, 31-43.

Bostrom, A., Morgan, M.G., Fischhoff, B. & Read, D., 1994. What do people know about global climate change? 1. Mental models. *Risk Analysis*, 14, 959-970.

Boyes, E. & Stanisstreet, M., 1993. The Greenhouse Effect – children's perceptions of causes, consequences and cures. *International Journal of Science Education*, 15, 531-552.

Boyes, E. & Stanisstreet, M., 1998. High school students' perceptions of how major global environmental effects might cause skin cancer. *Journal of Environmental Education*, 29 (2), 31-36.

Brewer, J. & Hunter, A., 1989. *Multimethod research: A synthesis of styles*. Newbury Park, CA: Sage.

Brown, B.B., Werner, C.M., Amburgey, J.W. & Szalay, C., 2007. Walkable Route Perceptions and Physical Features: Converging Evidence for En Route Walking Experiences. *Environment & Behaviour*, 39 (1), 34-61.

Buckingham-Hatfield, S. and Matthews, J., 1999. Including women: addressing gender. *In*: S. Buckingham-Hatfield and S. Percy, eds. *Constructing Local Environmental Agendas*. London: Routledge, 94-109.

Bulkeley, H., 2000. Common knowledge? Public understanding of climate change in Newcastle, Australia. *Public Understanding of Science*, 9, 313-333.

Carvalho, A., 2005. Representing the Politics of the Greenhouse Effect: Discursive strategies in the British media. *Critical Discourse Studies*, 2 (1), 1-29.

C-Change, 2008a. *About C-Change* [online].
Available at: http://www.switchonswitchoff.org/About [accessed 06 December 2008]

C-Change, 2008b. *Face your Elephant* [online].
Available at: http://www.switchonswitchoff.org/Go/Elephant [accessed 06 December 2008]

C-Change, 2008c. *Club nights* [online].
Available at: http://www.switchonswitchoff.org/Go/Club-Nights [accessed 06 December 2008]

Cohen, J., 1988. *Statistical power analysis for the behavioural sciences*, 2nd Ed. Hillsdale, New Jersey: Erlbaum Associates.

COI, 2006. *Attitudes to climate change wave 4: top line summary*. London: Central Office of Information.
Available at: http://www.climatechallenge.gov.uk/multimediaclimate_change_wave_4.ppt [Accessed 22 June 2007]

COI, 2007. *News Release – 2007 Survey of Public attitudes and Behaviours Toward the Environment* [online].
Available at: http://www.defra.gov.uk/environment/statistics/pubatt/download/pubattsum2007.pdf [accessed 03 September 2007]

Collins, J., Thomas, G., Willis, R. and Wilsdon, J., 2003. *Carrots, Sticks and Sermons: influencing public behaviour for environmental goals* [online].
Available at: http://www.green-alliance.org.uk/uploadedFiles/Publications/CarrotsSticksSermons.pdf [accessed 13 November 2006]

Colman, A.M., 2006. *A Dictionary of Psychology*, [Oxford Reference Online].
Available at: http://www.oxford reference.com/views/ENTRY.html?subview=Main&entry=t87.e1823&category= [accessed 09 January 2007]

Cortina, J.M., 1993. What is coefficient alpha – an examination of theory and applications. *Journal of Applied Psychology*, 78 (1), 98-104.

DECC, 2009. *Climate Change Act 2008* [online].
Available at: http://www.decc.gov.uk/en/content/cms/legislation/cc_act_08/cc_act_08.aspx [accessed 27 December 2009]

Defra, 2009. *Greener Living Fund* [online].
Available at: http://www.greenerlivingfund.org.uk/
[accessed 26 February 2010]

Defra, 2006a. *Climate Challenge Fund 2005-08: Guidance Notes for Applicants* [online].
Available at:http://www.climatechallenge.gov.uk/fund/DEFRA_CC_FundApplication_guidance_FINAL.pdf [accessed 17 March 2006]

Defra, 2006b. *Fund FAQs* [online].
Available at: http://www.climatechallenge.gov.uk/fund/faqs.html [accessed 17 March 2006]

Defra, 2006c. *Map of Activity* [online].
Available at: http://www.climatechallenge.gov.uk /whats_being_done/map/index.asp [accessed 28 September 2006]

Defra, 2005. *Statistical Release: 2003 UK Climate Change Sustainable Development Indicator and Greenhouse Gas Emissions Final Figures* [online].
Available at: http://www.defra.gov.uk /news/2005/050321a.htm [accessed 22 October 2006]

Defra, 2002. *Survey of public attitudes to quality of life and to the environment – 2001.* London: Defra Publications.

Deng, A.Y., Walker, G.J. & Swinnerton, G., 2006. A comparison of environmental values and attitudes between Chinese in Canada and anglo-Canadians. *Environment and Behaviour*, 38 (1), 22-47.

Devine-Wright, P., Devine-Wight, H. & Fleming, P., 2004. Situational influences upon children's beliefs about global warming and energy. *Environmental Education Research*, 10 (4), 493-506.

Dey, I., 1993, *Qualitative data analysis: a user-friendly guide for social scientists*. London: Routledge.

DfT, 2006. *An evidence base review of public attitudes to climate change and transport behaviour* [online].
Available at: http://www.dft.gov.uk/stellent/groups/dft_susttravel/ documents/page/dft_susttravel_612225.pdf#search=%22an%20evidence%20base%20review%20of%20public%22 [accessed 05 September 2006]

Downing, P. & Ballantyne, J., 2007. *Tipping Point or Turning Point? Social Marketing and Climate Change*. London: Ipsos MORI.

Downs, R.M. & Stea, D., 1973. Theory. In R.M. Downs & D. Stea, Eds. *Image and Environment*, Chicago, IL: Aldine.

Dunlap, R.E., Van Liere, K.D., Mertig, A.G. & Emmet Jones, R., 2000. Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale. *Journal of Social Issues*, 56 (3), 425-442.

Dunlap, R.E. & Van Liere, K.D., 1978. The “new environmental paradigm”: A proposed measuring instrument and preliminary results. *Journal of Environmental Education*, 9, 10-19.

Dunwoody, S., 2007. The challenge of trying to make a difference using media messages. *In*: S.C. Moser and L. Dilling, eds. *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*. Cambridge: Cambridge University Press, 89-104.

Ereaut, G. and Segnit, N. (2006). *Warm Words: How are we telling the climate story and can we tell it better?* London: IPPR [online].
Available at: http://www.ippr.org.uk/publicationsandreports/publication.asp?id=485 [accessed 24 September 2007]

Ereaut, G. and Segnit, N. (2007). *Warm Words II: How the climate story is evolving and the lessons we can learn for encouraging public action*. London: IPPR for Energy Saving Trust [online].
Available from: http://www.ippr.org.uk/publicationsandreports/publication.asp?id=561 [accessed 24 September 2007]

Everybody’s Talking, 2007. *Climate change is the biggest challenge facing us today; but together we can tackle it* [online].
Available at: http://www.everybodys-talking.org/ [accessed 17 July 2007]

Everybody’s Talking, 2009. *My Pledges* [online].
Available at: http://everybodys-talking.org/php/ [accessed 18 January 2008]

Fahy, F.,2005. The Right to Refuse: Public Attitudes and Behaviour towards Waste in the West of Ireland. *Local Environment*, 10 (6), 551-569.

Falk, J.H., 2005. Free-choice environmental learning: framing the discussion, *Environmental Education Research*, 11 (3), 265-280.

Festinger, L., 1957. *A Theory of Cognitive Dissonance*. Stanford: Stanford University Press.

Field, A., 2005. *Discovering Statistics Using SPSS.* 2nd ed. London: Sage.

Fishbein, M. & Ajzen, I., 1975. *Belief, Attitude, Intention, and Behaviour: An Introduction to Theory and Research*. Reading, MA: Addison Wesley.

Fleming, P., Devine-Wright, P., Dowsett, T. & Ajiboye, P., 2004. *Activity Based Sustainable Energy Futures for the Decision Makers of Tomorrow*, Final Report on EPSRC Grant GR/R78961/01.

Fleming, P., Dowsett, T. & Fleming, M., 2007. *The Global Village Festival 2006 – Young People and Environmental Sustainability*, Final Report on EPSRC Grant EP/C006429/1.

Fleming, M., Fleming, P., Thorpe, J. & MacGarry, A. (2007), *Young People and Energy Efficiency in Buildings*, Final Report to the Pilkington Energy Efficiency Trust.

Fortner, R.W., Lee, J.Y., Corney, J.R., Romanello, S., Bonnell, J., Luthy, B., Figuerido, C. & Ntsiko, N., 1998. Public Understanding of Climate Change: certainty and willingness to act. *Environmental Education Research*, 6 (2), 127-141.

Futerra, 2005a. *UK Communications Strategy on Climate Change* [online].
Available at: http://www.defra. gov.uk/Environment/climatechange/pubs/pdf/ccc-strategy.pdf [accessed 28 September 2006].

Futerra, 2005b. *The Rules of the Game: Principles of Climate Change Communication* [online]. Available at: http://www.defra.gov.uk/Environment/climatechange/pubs/pdf/ccc-rulesofthe game. pdf [Accessed 28 September 2006].

Gage, N., 1989. The paradigm wars and their aftermath: A "historical" sketch of research and teaching since 1989. *Educational Researcher*, 18, 4-10.

Gardner, G.T. & Stern, P.C., 1996. *Environmental problems and human behaviour*. Boston: Allyn and Bacon.

Gelbspan, R., 2004. *Boiling Point: How Politicians, Big Oil and Coal, Journalists and Activists have Fuelled the Climate Crisis – and What We Can do to Avert Disaster*. New York: Basic Books.

Gowda, M.V.R., Fox, J.C. & Magelky, R.D., 1997. Students' Understanding of Climate Change: Insights for Scientists and Educators. *Bulletin of the American Meteorological Society*, 78 (10), 2232-2240.

Gravetter, F.J. & Wallnau, L.B., 2004. *Statistics for the behavioural sciences*. 6th Ed. Belmont, California: Wadsworth.

Guba, E.G. & Lincoln, Y.S., 1994. Competing paradigms in qualitative research. *In*: N.K. Denzin & Y.S. Lincoln, eds. *Handbook of qualitative research.* Thousand Oaks, CA: Sage, 105-117.

Haq, G., Minx, J., Whitelegg, J. and Owen, A., 2007. *Greening the Greys: Climate Change and the Over 50s*. York: Stockholm Environment Institute.

Halpern, D., Bates, C., Mulgan, G., Aldridge, S., Beales, G. & Heathfield, A., 2004. *Personal Responsibility and Changing Behaviour: the state of knowledge and its implications for public policy* [online].
Available at: http://www.strategy.gov.uk/downloads/files/pr2.pdf [accessed 07 November 2006]

Heimlich, J.E., 2005. Editorial. *Environmental Education Research*, 11 (3), 261-263.

Henson, R., 2006. *The Rough Guide to Climate Change: The Symptoms. The Science. The Solutions*. London: Penguin.

Hinds, K., Carmichael, C. & Snowling, H., 2002. *Public Attitudes to the Environment in Scotland*. Edinburgh: Scottish Executive.

Hughes, J.A. & Sharrock, W.W., 1997. *The Philosophy of Social Research*. 3rd Ed. Harlow: Addison Wesley Longman.

IPCC, 2001. *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press: Cambridge.

IPCC, 2007. Summary for Policymakers. *In* S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller, eds. *Climate Change 2007. The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

Irvine, K.N., 1997. *Stewardship in the management of private forests: some psychological dimensions*. Unpublished MSc thesis, University of Michigan.

Johnson, S., 1967. Hierarchical clustering schemes. *Psychometrika*, 38, 241-24.

Kaplan, S., 1978. Attention and fascination: the search for cognitive clarity. *In*: S. Kaplan & R. Kaplan, Eds. *Humanscape: Environments for people*. Belmont, CA: Duxbury.

Kearney, A.R., 1997. *Some implications of cognitive map theory for environmental problem solving and decision making*. Unpublished PhD thesis, University of Michigan.

Kearney, A.R., Bradley, G., Kaplan, R. & Kaplan, S., 1999. Stakeholder Perspectives on Appropriate Forest Management in the Pacific Northwest. *Forest Science*, 45 (1), 62-73.

Kearney, A.R. & Kaplan, S., 1997. Toward a methodology for the measurement of knowledge structures of ordinary people: the conceptual content cognitive map. *Environment and Behaviour*, 29 (5), 579-617.

Kempton, W., 1991. Lay Perspectives on Climate Change. *Global Environmental Change*, 1, 183-208.

Kempton, W., 1993. Will public environmental concern lead to action on global warming? *Annual Review of Energy and Environment*, 18, 217-245.

Kirwan, K. (2007). *Social-Psychological Aspects of Low-Income Tenants' Responses to Solar Photovoltaics*. Unpublished PhD thesis, De Montfort University, Leicester.

Kitchin, R.M., 1994. Cognitive Maps: what are they and why study them? *Journal of Environmental Psychology*, 14, 1-19.

Kitchin, R. & Tate, N.J., 2000. *Conducting Research into Human Geography: Theory, Methodology and Practice*. Harlow: Pearson.

Kolakowski, L., 1993. An Overall View of Positivism. *In*: M. Hammersley, ed. *Social Research: Philosophy, Politics and Practice*. London: Sage, 1-8.

Kollmuss, A. & Agyeman, J., 2002. Mind the Gap: why do people act environmentally and what are the barriers to pro-environmental behaviour? *Environmental Education Research*, 8 (3), 239-260.

Koulaidis, V. & Christidou, V., 1999. Models of Students' Thinking Concerning the Greenhouse Effect and Teaching Implications. *Science Education*, 83, 559-576.

Lee, S. & Kant, K., 2006. Personal and group forest values and perceptions of groups' forest values in northwestern Ontario. *The Forestry Chronicle*, 82 (4), 512-520.

Leeming, F.C., Dwyer, W.O. and Bracken, B.A., 1995. Children's Environmental Attitude and Knowledge Scale: Construction and Validation. *Environmental Education*, 26 (3), 22- 31.

Leiserowitz, A., 2006. Climate change risk perception and policy preferences: the role of affect, imagery and values. *Climatic Change*, 77 (1-2), 45-72.

Likert, R., 1932. A technique for the measurement of attitudes. *Archives of Psychology*, 140, 5-53.

Lorenzoni, I., Nicholson-Cole, S. & Whitmarsh, L., 2007. Barriers to engaging with climate change among the UK public and their policy implications. *Global Environmental Change*, 17, 445-459.

Lorenzoni, I. & Hulme, M, 2009. Believing is seeing: laypeople's views of future socio-economic and climate change in England and in Italy. *Public Understanding of Science*, 18, 383-400.

LVQ, 2006. *Attitudes to Climate Change – Youth Sample* [online].
Available at: http://www.climatechallenge.gov.uk/multimedia/climate_change_toplines_YOUTH. pdf [accessed 27 September 2006]

Maloney, M.P. & Ward, M.P., 1973. Ecology: Let's Hear from the People. *American Psychologist*, 28, 583-586.

Mandler, G., 1975. Memory storage and retrieval: some limits on the research of attention and consciousness. *In*: P.M. Rabbitt & S. Dornic, Eds. *Attention and performance*, vol. 5. London: Academic.

McGowan, F. & Sauter, R., 2005. *Public Opinion on Energy Research: A Desk Study for the Research Councils* [online].
Available at: http://www.epsrc.ac.uk/ResearchFunding/Programmes/Energy/AdviceConsult/PublicOpinionEnergyReport.htm [accessed 15 February 2006]

Moser, S.C., 2007. More bad news: the risk of neglecting emotional responses. *In*: S.C. Moser and L. Dilling, eds. *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*. Cambridge: Cambridge University Press, 64-80.

Moser, S.C. & Dilling, L., 2007. Toward the social tipping point: creating a climate for change. *In*: S.C. Moser and L. Dilling, eds. *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*. Cambridge: Cambridge University Press, 491-516.

Moscovici, S., 2000. *Social Representations*. London: Polity Press.

National Energy Efficiency Awards, 2008. *2008 Winners and Finalists* [online].
Available at: http://www.energyawards.org.uk/ [accessed 09 January 2009].

National Statistics, 2001. *Census 2001: the most comprehensive survey of the UK population* [online].
Available at: http://www.statistics.gov.uk/census2001/census2001.asp [accessed 18 July 2007]

Nitz, M., Jarvis, S. & Kenski, H., 1996. Television news coverage of global warming. *World Resource Review*, 8 (2), 158-177.

Nooney, J.G., Woodrum, E., Hoban, T.J. & Clifford, W.B., 2003. Environmental worldview and behaviour – Consequences of dimensionality in a survey of North Carolinians. *Environment and Behaviour*, 35 (6), 763-783.

Norton, A. & Leaman, J., 2004. *The Day After Tomorrow: Public Opinion on Climate Change*. London: MORI Social Research Institute.

Oppenheim, A.N., 1992. *Questionnaire Design, Interviewing and Attitude Measurement*. London: Continuum.

Oppenheimer, M. & Todorov, A., 2006. Global Warming: The Psychology of Long Term Risk; Guest Editorial. *Climatic Change*, 77 (1-2), 1-6.

Pallant, J., 2001. *SPSS Survival Manual: a step by step guide to data analysis using SPSS*. Maidenhead: Open University Press.

Pawlik, K., 1991. The Psychology of Global Environmental Change: Some Basic Data and an Agenda for Cooperative International Research. *International Journal of Psychology*, 26 (5), 547-563.

Pierce, J.C., Lovrich, N.P., Tsurutani, T. & Abe, T., 1987. Culture, politics and mass publics – traditional and modern supporters of the new environmental paradigm in Japan and the United States. *Journal of Politics*, 49 (1), 54-79.

Pooley, J.A. & O'Connor, M., 2000. Environmental Education and Attitudes: Emotions and Beliefs Are What Is Needed. *Environment and Behaviour*, 32 (5), 711-723.

Poortinga, W & Pidgeon, N., 2003. *Public Perceptions of Risk, Science and Governance: Main Findings of a British Survey of Five Risk Cases*. Norwich: University of East Anglia.

Poortinga, W., Pidgeon, N.F. & Lorenzoni, I., 2006. *Public Perceptions of Nuclear Power, Climate Change and Energy Options in Britain: Summary Findings of a Survey Conducted During October and November 2005. Technical Report* (Understanding Risk Working Paper 06-02). Norwich: Centre for Environmental Risk.

Potter, J., 1998. Fragments in the Realization of Relativism. *In*: I. Parker, ed. *Social Constructionism, Discourse and Realism*. London: Sage, 168-183.

Pratt, L.G. & Rabkin, S., 2007. Listening to the audience: San Diego hones its communication strategy by soliciting residents' views. *In*: S.C. Moser and L. Dilling, eds. *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*. Cambridge: Cambridge University Press, 105-118.

Pruneau, D., Gravel, H., Bourque, W. & Langis, J., 2003. Experimentation with a Socio-constructivist Process for Climate Change Education. *Environmental Education Research*, 9 (4), 429-446.

Reber, A.S. & Reber, E., 2001. *Dictionary of Psychology*. 3rd Ed. London: Penguin Books Ltd.

Robson, C., 2002. *Real World Research*. Oxford: Blackwell.

Rogers, E.M., 1995. *Diffusion of Innovations*. 4th Ed. New York: The Free Press.

Schwartz, S.H., 1977. Normative influences on altruism. *In*: L. Berkowitz, ed. *Advances in Experimental Social Psychology: Vol. 10*. New York: Academic Press.

Spence, A. & Pidgeon, N., 2010. Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change*, 20, 656-667.

Stern, N., 2007. The Economics of Climate Change: The Stern Review. Cambridge: Cambridge University Press.

Stern, P.C., 2000a. Toward a Coherent Theory of Environmentally Significant Behaviour. *Journal of Social Issues*, 56 (3), 407-424.

Stern, P.C., 2000b. Psychology, sustainability, and the science of human-environment interactions. *American Psychologist*, 55, 461-478.

Stern, P.C., Dietz, T., Abel, T., Guagnano, G.A. & Kalof, L., 1999. A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism. *Human Ecology Review*, 6, 81-97.

Tabachnick, B.G. & Fidell, L.S., 1996. *Using multivariate statistics*. 3rd ed. New York: HarperCollins.

Tashakkori, A. & Teddlie, C., 1998. *Mixed Methodology: Combining Qualitative and Quantitative Approaches*. Thousand Oaks, CA: Sage.

Tesch, R., 1990. *Qualitative Research: Analysis Types and Software Tools*, London: Falmer Press.

Thompson, M. & Rayner, S., 1998. Risk and Governance Part 1: the discourse of climate change. *Governance and Opposition*, 33 (2), 139-166.

Tikkanen, J., Isokaanta, T., Pykalainen, J. & Leskinen, P., 2006. Applying cognitive mapping approach to explore the objective-structure of forest owners in a Northern Finnish case area. *Forest Policy and Economics*, 9, 139-152.

Tilt, J.H., Kearney, A.R. & Bradley, G., 2007. Understanding rural character: Cognitive and visual perceptions. *Landscape and Urban Planning*, 81, 14-26.

Triandis, H.C., 1977. *Interpersonal Behaviour.* Monterey, CA: Brooks/Cole.

Uzzell, D.L., 2000. The psycho-spatial dimension of global environmental problems. *Journal of Environmental Psychology*, 20, 307-318.

Uzzell, D.L., 1999. Education for Environmental Action in the Community: new roles and relationships. *Cambridge Journal of Education*, 29 (3), 397-413.

Wall, R., 2006. *Psychological and Contextual Influences on Travel-Mode Choice for Commuting*. Unpublished PhD thesis, De Montfort University, Leicester.

Wellingborough Partnership, 2006. *Climate Challenge Fund Application Form*.

White, T., 2008. An analysis of attitudes towards climate change and the role of interventions in attitude change. In: IAPS (International Association of People-Environment Studies), *20th IAPS Conference*. Rome, Italy 28 July – 1 August 2008.

White, T. & Wall, R., 2008. National, regional and local attitudes towards climate change: identifying appropriate target audiences for communications. *Local Environment*, 13 (7), 589-607.

Whitmarsh, L., 2009a. What's in a name? Commonalities and differences in public understanding of "climate change" and "global warming". *Public Understanding of Science*, 18, 401-420.

Whitmarsh, L., 2009b. Behavioural responses to climate change: Asymmetry of intentions and impacts. *Journal of Environmental Psychology*, 29, 13-23.

Williams, M. & May, T., 1996. *Introduction to the philosophy of social research*. London: UCL Press.

Woodcraft Folk, 2006. *Welcome to our website* [online].
Available at: http://www.woodcraft.org.uk/ [accessed 03 October 2006]

Woods, B. & Moscardo, G., 2003. Enhancing wildlife education through mindfulness. *Australian Journal of Environmental Education*, 19, 97-108.

Appendices

Appendix 1: Questionnaires

1: Instructions to call centre operatives for 'Everybody's talking about climate change' questionnaire
2: 'Wellingborough Toolkit' questionnaire
3: C-Change questionnaire

'Everybody's talking about climate change' – Project Evaluation Questionnaire

The words and phrases to be spoken by Call Centre Operatives are written in *Italics*, with potential answers written in **bold**. Instructions to Operatives are written in ***Bold Italics***. The numbers in brackets after each potential answer should be placed in the spreadsheet of answers. For open-ended questions, the typed responses should automatically be entered into the spreadsheet.

Introduction to potential respondents

Hello. My name is…… and I work for Derbyshire County Council. We are working in partnership with all the Councils in Derbyshire and Nottinghamshire on a project about Climate Change. We would like to ask you a few questions about this, which should only take a few minutes of your time. Is this OK?

If yes……

Thank you very much. Remember that there are no right or wrong answers; we just want to collect people's opinions on the issue of Climate Change. Are you ready to begin?

Yes……

First of all, I would like to ask you three questions about yourself……

[Note: If this information is available on the list of potential respondents provided by Experian, the operative should still confirm the answers at this stage of the survey in order to ensure that they are speaking to the correct person and that all the necessary information is collated in a single data file]

A	*How old are you?*	**18-24 (1)**	**25-64 (2)**	**65 and over (3)**
B	*Gender*	**Male (1)**	**Female (2)**	
C	*County of residence*	**Derbyshire (1)**	**Nottinghamshire (2)**	

1. *I am now going to read out a number of terms that relate to the environment. For each one, I would like you to tell me if you were aware of the phrase before today.*

Global Warming	**Yes (1)**	**No (2)**	**Unsure (0)**
Climate Change	**Yes (1)**	**No (2)**	**Unsure (0)**
Greenhouse Effect	**Yes (1)**	**No (2)**	**Unsure (0)**
Carbon Dioxide	**Yes (1)**	**No (2)**	**Unsure (0)**
Carbon emissions	**Yes (1)**	**No (2)**	**Unsure (0)**
Climate Change gases	**Yes (1)**	**No (2)**	**Unsure (0)**

2. *Do you agree or disagree that the world's climate is changing?*

Agree strongly (1)	Agree slightly (2)	Disagree slightly (3)	Disagree strongly (4)	Unsure (0)

[If the respondent is unaware of all the terms in question 1 AND disagrees slightly or strongly on question 2, the remainder of the questions are not asked. The operative should thank them for their time and end the call]

3. *To what extent do you think Climate Change is a result of human behaviour or natural changes? Do you think Climate Change is……?*

Due entirely to human behaviour (1)	Due mainly to human behaviour (2)	Due mainly to natural changes (3)	Due entirely to natural changes (4)	Unsure (0)

4. *Which of the following do you think you personally contribute to?*

Emissions from cars/vans/buses	**Yes (1)**	**No (2)**	**Unsure (0)**
Carbon dioxide emissions	**Yes (1)**	**No (2)**	**Unsure (0)**
Pollution	**Yes (1)**	**No (2)**	**Unsure (0)**
Burning fossil fuels for energy	**Yes (1)**	**No (2)**	**Unsure (0)**
Destruction of the rainforests	**Yes (1)**	**No (2)**	**Unsure (0)**

5. *How concerned are you about the impact of Climate Change in the UK?*

Very concerned (1)	Fairly concerned (2)	Not very concerned (3)	Not at all concerned (4)	Unsure (0)

6. *I am going to read out a number of words that some people have used to describe their attitude to Climate Change. For each pair, I would like you to tell me which word best reflects your own opinion.*

Hopeful or fearful	**Hopeful (1)**	**Fearful (2)**
Motivated or unmotivated	**Motivated (1)**	**Unmotivated (2)**
Positive or negative	**Positive (1)**	**Negative (2)**
Enthused or frustrated	**Enthused (1)**	**Frustrated (2)**

7. ***A*** *How much influence do you think the UK Government can have on limiting Climate Change?*

No influence (1)	A little influence (2)	Some influence (3)	A large influence (4)	Unsure (0)

B *How much influence do you think industry and businesses can have on limiting Climate Change?*

No influence (1)	A little influence (2)	Some influence (3)	A large influence (4)	Unsure (0)

C *How much influence do you think <u>you personally</u> can have on limiting Climate Change?*

No influence (1)	A little influence (2)	Some influence (3)	A large influence (4)	Unsure (0)

D *How much influence do you think <u>your local community</u> can have on limiting Climate Change?*

No influence (1)	A little influence (2)	Some influence (3)	A large influence (4)	Unsure (0)

<u>8.</u> *Who, if anyone, have you heard talking about Climate Change recently?*

The Government or Politicians	**Yes (1)**	**No (2)**	**Unsure (0)**
Charities or Pressure Groups	**Yes (1)**	**No (2)**	**Unsure (0)**
Friends/Family	**Yes (1)**	**No (2)**	**Unsure (0)**
Celebrities	**Yes (1)**	**No (2)**	**Unsure (0)**
Your Local Authority	**Yes (1)**	**No (2)**	**Unsure (0)**
Colleagues at work	**Yes (1)**	**No (2)**	**Unsure (0)**
Children	**Yes (1)**	**No (2)**	**Unsure (0)**
Local community Groups	**Yes (1)**	**No (2)**	**Unsure (0)**
No one	**Yes (1)**	**No (2)**	**Unsure (0)**
Someone else	**Yes (1)**	**No (2)**	**Unsure (0)**

If you answered Yes to "someone else", who have you heard talk about Climate Change recently?

<u>9.</u> *And where, if anywhere, have you seen or heard anything about Climate Change recently?*

<u>10.</u> *How often, if at all, do you talk about Climate Change with your friends and family?*

Never (1)	Every 6 months (2)	Monthly (3)	Fortnightly (4)	Weekly (5)	Daily (6)

11. *To what extent do you agree with the following statements?*

We are approaching the point at which the Earth's Climate System cannot function

Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Unsure (0)

Humans have the right to release into the atmosphere as much carbon dioxide as they wish

Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Unsure (0)

The effect of climate change on plants and animals is as important as its effect on humans

Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Unsure (0)

Humans will eventually be able to provide technological and scientific solutions to climate change

Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Unsure (0)

Humans are seriously abusing the Earth's atmosphere

Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Unsure (0)

The possible consequences of climate change have been greatly exaggerated

Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Unsure (0)

Climate Change has become more of an issue for me in this last year

Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Unsure (0)

I personally can help limit the effects of climate change

Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Unsure (0)

That's all the questions finished. Many thanks for your time.

Extra campaign-specific questions asked only in the post-communication survey

12. *There have recently been several campaigns relating climate change. Have you heard of any of the following?*

Save your 20%	**Yes (1)**	**No (2)**	**Unsure (0)**
Act on CO2	**Yes (1)**	**No (2)**	**Unsure (0)**
'Everybody's talking about CC'	**Yes (1)**	**No (2)**	**Unsure (0)**
Derby 7Cs	**Yes (1)**	**No (2)**	**Unsure (0)**
Tomorrow's climate, Today's Challenge	**Yes (1)**	**No (2)**	**Unsure (0)**

[If the respondent has not heard about 'Everybody's talking about climate change', the remainder of the questions are not asked. The operative should thank them for their time and end the call]

13. *Have you heard about 'Everybody's talking' through any of the following channels?*

Local radio	**Yes (1)**	**No (2)**	**Unsure (0)**
Newspaper	**Yes (1)**	**No (2)**	**Unsure (0)**
Magazine	**Yes (1)**	**No (2)**	**Unsure (0)**
At work	**Yes (1)**	**No (2)**	**Unsure (0)**
Website	**Yes (1)**	**No (2)**	**Unsure (0)**
Public event or show	**Yes (1)**	**No (2)**	**Unsure (0)**
Local library	**Yes (1)**	**No (2)**	**Unsure (0)**
At school/college	**Yes (1)**	**No (2)**	**Unsure (0)**
Family/friend/colleague	**Yes (1)**	**No (2)**	**Unsure (0)**
Other	**Yes (1)**	**No (2)**	**Unsure (0)**

If you answered Yes to "other", where have you heard about 'Everybody's talking about climate change'?

14. *The 'Everybody's talking' campaign is about pledging to reduce your household carbon emissions - did you personally make a pledge?*

Yes (1) **No (2)** **Unsure (0)**

That's all the questions finished. Many thanks for your time.

The Wellingborough Partnership and De Montfort University

Please could you fill in the following short questionnaire about climate change and hand it to the session administrator before the presentation begins. Many thanks.

Are you…? Male ❑ Female ❑	**Age**……	**Name**……

1. Below are a number of terms that relate to the environment. For each one, could you say if you were aware of the phrase before today (please tick one box on each row)?

Phrase	Yes	No	Unsure
Global Warming			
Climate Change			
Carbon Dioxide			
Carbon Emissions			
Climate Change gases			
Greenhouse effect			

2. Do you agree or disagree that the world's climate is changing (Please tick one box below)?

Agree strongly	Agree slightly	Disagree slightly	Disagree strongly	Unsure

3. To what extent do you think Climate Change is a result of human behaviour or natural changes? Do you think Climate Change is……(please tick one box below)?

Due entirely to human behaviour	Due mainly to human behaviour	Due mainly to natural changes	Due entirely to natural changes	Unsure

4. How concerned are you about the impact of Climate Change in the UK (please tick one box below)?

Very concerned	Fairly concerned	Not very concerned	Not at all concerned	Unsure

5. Below are several pairs of words that some people have used to describe their attitude to Climate Change. For each pair, could you tick which word best reflects your own opinion (please tick one box for each pair of words)?

A	❑	Hopeful	***or***	Fearful	❑
B	❑	Motivated	***or***	Unmotivated	❑
C	❑	Positive	***or***	Negative	❑
D	❑	Enthused	***or***	Frustrated	❑

6. How much influence do you think each of the following individuals and groups can have on limiting Climate Change (please tick one box per row)?

	No influence	A little influence	Some influence	A large influence	Unsure
1. The UK Government					
2. Industry & Businesses					
3. Your local community					
4. You personally					

7. Who, if anyone, have you heard talking about climate change recently (please tick all relevant boxes)?

- ❑ The Government or Politicians
- ❑ Friends/family
- ❑ Your Local Authority
- ❑ Children
- ❑ No one
- ❑ Charities or Pressure Groups
- ❑ Celebrities
- ❑ Colleagues at work
- ❑ Local Community Groups
- ❑ Someone else

8. Where, if anywhere, have you seen or heard anything about Climate Change recently (please list all places)?

9. How often, if at all, do you talk about Climate Change with your family and friends (please tick one box below)?

Never	Every 6 months	Monthly	Fortnightly	Weekly	Daily

10. To what extent to do you agree with the following statements (please tick one box per row)?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Unsure
We are approaching the point at which the Earth's Climate System cannot function						
Humans have the right to release into the atmosphere as much carbon dioxide as they wish						
The effect of climate change on plants and animals is as important as its effect on humans						
Humans will eventually be able to provide technological and scientific solutions to climate change						
Humans are seriously abusing the Earth's atmosphere						
The possible consequences of climate change have been greatly exaggerated						

MANY THANKS FOR YOUR TIME.

C-Change Questionnaire

C-Change is a project funded by the Defra Climate Challenge Fund. Project partners are the Woodcraft Folk, the Centre for Alternative Technology and De Montfort University. Please could you fill in the following short questionnaire about climate change and hand it back to a member of C-Change staff before the event begins. Many thanks.

Are you…? Male ❑ Female ❑	**Woodcraft member?** Y ❑ N ❑	**Age**	**Email** .....

1. Below are a number of terms that relate to the environment. For each one, could you say if you were aware of the phrase before today (please tick one box on each row)?

Phrase	Yes	No	Unsure
Global Warming			
Climate Change			
Carbon Dioxide			
Carbon Emissions			
Climate Change gases			
Greenhouse effect			

2. Do you agree or disagree that the world's climate is changing (Please tick one box below)?

Agree strongly	Agree slightly	Disagree slightly	Disagree strongly	Unsure

3. To what extent do you think Climate Change is a result of human behaviour or natural changes? Do you think Climate Change is……(please tick one box below)?

Due entirely to human behaviour	Due mainly to human behaviour	Due mainly to natural changes	Due entirely to natural changes	Unsure

4. How concerned are you about the impact of Climate Change in the UK (please tick one box below)?

Very concerned	Fairly concerned	Not very concerned	Not at all concerned	Unsure

5. Below are several pairs of words that some people have used to describe their attitude to Climate Change. For each pair, could you tick which word best reflects your own opinion (please tick one box for each pair of words)?

A ❑	Hopeful	***or***	Fearful	❑
B ❑	Motivated	***or***	Unmotivated	❑
C ❑	Positive	***or***	Negative	❑
D ❑	Enthused	***or***	Frustrated	❑

6. How much influence do you think the each of the following individuals and groups can have on limiting Climate Change (please tick one box per row)?

	No influence	**A little influence**	**Some influence**	**A large influence**	**Unsure**
1. The UK Government					
2. Industry & Businesses					
3. Your local community					
4. You personally					

7. Who, if anyone, have you heard talking about climate change recently (please tick all relevant boxes)?

❑ The government or politicians
❑ Friends/family
❑ Your local authority
❑ Children
❑ Charities or pressure groups
❑ Celebrities
❑ Colleagues at work
❑ Local community groups

8. Where, if anywhere, have you seen or heard anything about Climate Change recently (please list all places)?

9. How often, if at all, do you talk about Climate Change with your family and friends (please tick one box below)?

Never	Every 6 months	Monthly	Fortnightly	Weekly	Daily

10. To what extent to do you agree with the following statements (please tick one box per row)?

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**	**Unsure**
We are approaching the point at which the Earth's Climate System cannot function						
Humans have the right to release into the atmosphere as much carbon dioxide as they wish						
The effect of climate change on plants and animals is as important as its effect on humans						
Humans will eventually be able to provide technological and scientific solutions to climate change						
Humans are seriously abusing the Earth's atmosphere						
The possible consequences of climate change have been greatly exaggerated						

Additional post-communication survey questions

11. Have you changed your behaviour since you engaged with the C-Change project?

Yes	No	Unsure

In what way have you behaved differently since engaging with C-Change?

12. The following methods could be used to reduce greenhouse gas emissions. On a scale of 1 to 5, how important do you think each method is (1=Not at all important; 5=Very important)?

	1	2	3	4	5	Unsure
Changing the behaviour of individuals						
Reducing energy use (i.e. insulating houses, very efficient heating systems and heating controls, low energy fridges, low energy lightbulbs etc.)						
Renewable energy supply (i.e. solar energy, biomass for heating)						
Nuclear energy						
Carbon emissions trading						
Carbon offsetting						

13. To what extent do you agree with the following statement: I have a greater understanding of the science and engineering of reducing greenhouse gas emissions since engaging with C-Change?

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Unsure

Appendix 2: Interview schedules

1: 'Everybody's talking about climate change' interview schedule
2: 'Wellingborough Toolkit' interview schedule
3: Post-interview questionnaire

Schedule for 3CM Interviews – 'Everybody's talking about climate change'

Introduction

First of all I'd like to thank you for taking part. My name is Tom White and I'm studying for a PhD at DMU in Leicester. I am interested in finding out what people's attitudes towards climate change are. I would also like to talk about the 'everybody's talking about climate change' project and ask you some survey questions. Consequently, we will spend most of our time discussing your views on climate change.

A few important points about the interview:

This is an exploratory process, so there are no right or wrong answers; I am just interested in discovering what your own opinions are in relation to these issues. As such, you are the expert and I am trying to learn.
Feel free to expand on any points or ask questions at any time.
If you wish to stop at any point, just let me know.
Everything you say will remain confidential; the results will be written up but no individual will be personally identified.
Is it OK if I record our conversation so that I can refer back to it during my analysis?
The process should take approximately 45 minutes.
Do you have any questions before we begin?

Task Outline

I'd like to stress again that there are no correct or right answers.
This is an exploratory process, so anything goes [make notes on how interview goes].

1. I am interested in finding out what your views are in relation to climate change.

2. Imagine that a friend who has not previously thought about climate change asks you to share your view on the issue. What are the important things you would want to mention?

3. It is often helpful to write these words and phrases down on paper to collect your thoughts and then go back and look at them as a whole. Prompts:

- What is the first thing you think of when you hear the words 'climate change'?
- What have you discussed when talking about climate change with other people?
- How would you describe your attitude towards climate change?

Write down each idea on a separate piece of white paper and place each idea on the table facing interviewee. When the interviewee appears to have finished ask…

4. Are there any other things that come to mind that you want to include. If not, we may have enough to work with here.

5. Look through these ideas and see if you can arrange them into groups based on how you think they go together. How might you organise your thoughts when describing your view on climate change?

Offer the list of ideas used by others: "Sometimes, after people finish this task they think of something later. I'd like to show you some things that other people have included, and you may choose to include some of them, or not. Either is fine. Are there any here that you'd like to use? Do you wish to add any more of your own now that you've seen this list?"

Worrying	Nonsense	Political aspects
Individual responsibility	Contradictory evidence	Research
Unavoidable	Concerning	Flooding
Media Hype	Carbon emissions	Better weather
Technological solutions	Everyone needs to do their bit	

6. Think of a label for each category – one or two words that capture what the ideas have in common. Could you explain why you've clustered these ones together?

Write the label on a piece of <u>blue</u> paper and place it with the idea that it describes.

7. I'd now like to talk about the 'Everybody's talking about climate change' project. I'm interested in how the issues that we've just discussed relate to the campaign, if at all. Prompts:

- Could you describe what you've seen or heard about the campaign?
- Was this interesting, understandable, well-explained, difficult to understand, well presented?
- What new things did you learn? On the website? Since seeing ET?
- Have you made a pledge? How did this make you feel?
- Could you suggest anything to make the campaign more appealing?
- What message do you think the project is trying to convey?
- Whereabouts have you seen stuff about climate change before?
- How reliable is the information you receive about climate change?
- Did 'Everybody's talking' contradict anything you though/felt before about CC?
- Did you believe all the information you saw?
- Have you discussed the campaign with anyone else?

Would you like to add anything further now that we've discussed 'Everybody's talking'?

Photograph or sketch the map produce by the interviewee, code slips of paper.
[1 = 'own generated',2 = 'from list' or 3 = 'own generated after viewing list']
Clip each category together, place into envelope with name of respondent written on it.

Continue with demographic portion of survey.

Schedule for 3CM Interviews – Wellingborough Partnership Toolkit

Introduction

First of all I'd like to thank you for taking part. My name is Tom White and I'm studying for a PhD at DMU in Leicester. I am interested in finding out what people's attitudes towards climate change are. I would also like to talk about the presentation you saw called the Wellingborough Partnership Toolkit and ask you some survey questions. Consequently, we will spend most of our time discussing your views on climate change.

A few important points about the interview:

This is an exploratory process, so there are no right or wrong answers; I am just interested in discovering what your own opinions are in relation to these issues. As such, you are the expert and I am trying to learn.
Feel free to expand on any points or ask questions at any time.
If you wish to stop at any point, just let me know.
Everything you say will remain confidential; the results will be written up but no individual will be personally identified.
Is it OK if I record our conversation so that I can refer back to it during my analysis?
The process should take approximately 45 minutes.
Do you have any questions before we begin?

Task Outline

I'd like to stress again that there are no correct or right answers.
This is an exploratory process, so anything goes [make notes on how interview goes].

1. I am interested in finding out what your views are in relation to climate change.

2. Imagine that a friend who has not previously thought about climate change asks you to share your view on the issue. What are the important things you would want to mention?

3. It is often helpful to write these words and phrases down on paper to collect your thoughts and then go back and look at them as a whole. Prompts:

- What is the first thing you think of when you hear the words 'climate change'?
- What have you discussed when talking about climate change with other people?
- How would you describe your attitude towards climate change?

Write down each idea on a separate piece of white paper and place each idea on the table facing interviewee. When the interviewee appears to have finished ask…

4. Are there any other things that come to mind that you want to include. If not, we may have enough to work with here.

5. Look through these ideas and see if you can arrange them into groups based on how you think they go together. How might you organise your thoughts when describing your view on climate change?

Offer the list of ideas used by others: "Sometimes, after people finish this task they think of something later. I'd like to show you some things that other people have included, and you may choose to include some of them, or not. Either is fine. Are there any here that you'd like to use? Do you wish to add any more of your own now that you've seen this list?"

Worrying	Nonsense	Political aspects
Individual responsibility	Contradictory evidence	Research
Unavoidable	Concerning	Flooding
Media Hype	Carbon emissions	Better weather
Technological solutions	Everyone needs to do their bit	

6. Think of a label for each category – one or two words that capture what the ideas have in common. Could you explain why you've clustered these ones together?

Write the label on a piece of <u>blue</u> paper and place it with the idea that it describes.

7. I'd now like to talk about the presentation you saw called the 'Wellingborough Partnership Toolkit'. I'm interested in how the issues that we've just discussed relate to the presentation you saw, if at all. Prompts:

- Could you describe what happened at the presentation?
- Was the presentation interesting, understandable, well-explained, difficult to understand, good presenter?
- What new things did you learn at the talk? On the leaflets? Since the talk?
- What was the most/least interesting part of the presentation?
- Could you suggest anything to make the presentation more appealing?
- What message did you think the toolkit was aiming to convey?
- Whereabouts have you seen stuff about climate change before?
- How reliable is the information you receive about climate change?
- Did the presentation contradict anything you though/felt before about CC?
- Did you believe everything you were told at the presentation?
- Have you discussed the contents of the presentation with anyone else?

Would you like to add anything further now that we've discussed the toolkit?

Photograph or sketch the map produce by the interviewee, code slips of paper.
[1 = 'own generated',2 = 'from list' or 3 = 'own generated after viewing list']
Clip each category together, place into envelope with name of respondent written on it.

Continue with demographic portion of survey.

Post-interview Questions

Name:

Age:

Gender:

Group:

Where did you engage with the project?

Are you a member of environmental groups?

Have you seen any other CCF projects?

Have you ever calculated your own carbon footprint? **Yes (where?)_____**
No

Please answer the following questions: 1 = not at all; 3 = somewhat; 5 = very much

1 2 3 4 5 How well did this task express your thoughts about climate change?
1 2 3 4 5 Did this task clarify your own understanding of climate change?
1 2 3 4 5 Did you enjoy the task card-sorting task?

Length of interview: minutes

How did the interview go?

Appendix 3: Toolkit for structured 3CM

1: Instructions
2: List of concepts

Exploring how you think about climate change

- Imagine that a friend has asked you to share your view about climate change. What important things would you want to mention?
- Read through the words and phrases on the piece of white A4 paper
- Pick those that you would use when describing your view of climate change. Choose as few or as many as you feel are important to mention. Feel free to make notes on the A4 paper
- Write down the ones you choose on white cards. If there are any words or phrases not included in the list that you think are important, please write them down on yellow cards
- Next, look through all the words and phrases you have chosen and organise them into groups based on how you think they go together
- Think of a label for each group (one or two words that capture what they have in common) and write each label on a pink card
- Paper clip each group together and place in the envelope

MANY THANKS

CONCEPTS

Angry at others	**Government responsibility**	**Polluting industry**
Awareness is high	**Health impacts**	**Positive impacts**
Carbon emissions	**Impact on food production**	**Recycling**
Changes in weather patterns	**Impacts on humans and society**	**Reduce energy use**
Climate change is caused by humans	**Individual actions**	**Renewable energy**
Climate change is happening	**Individual responsibility**	**Resignation**
Company profits	**Information at work**	**Scientific evidence**
Confused	**Information from media**	**Sea level rises**
Cost	**Insulation**	**Stop flying**
Discuss with family and friends	**International co-operation**	**Sustainable transport**
Don't think about CC often	**Knock on effects**	**Technological solutions**
Education	**Legislation and policy**	**Temperature rises**
Effects on nature	**Media hype**	**Unconcerned**
Energy saving lightbulbs	**Melting ice caps**	**Water wastage**
Extreme weather	**Natural phenomenon**	**Wider environmental issues**
Flooding	**Other people should act**	**Worse impacts on poorer people**
Food decisions	**Ozone layer**	**Worry**
Government corruption	**Packaging**	

Appendix 4: Copy of presentation at IAPS Conference, Rome, July 2008

IAPS Conference, 28 July – 1 August 2008 Rome

An analysis of attitudes towards climate change and the role of interventions in attitude-change

Tom White
Institute of Energy and Sustainable Development
De Montfort University
Leicester, UK

Presentation outline

- Two case study projects
- Background on 3CM methodology
- Data collection and analysis
- Results
- Next steps

Institute of Energy and Sustainable Development

Case study projects

- Two projects funded by Defra under the UKCCCI
  - Sponsored local projects
  - Focused specifically on changing attitudes
- Case study one
  Everybody's talking about climate change

'Everybody's talking about climate change' purchased a mobile advice centre and toured local shows

- Case study two
  Wellingborough Toolkit

'Wellingborough Toolkit' displayed mocked-up impacts of climate change in their presentation

Research questions

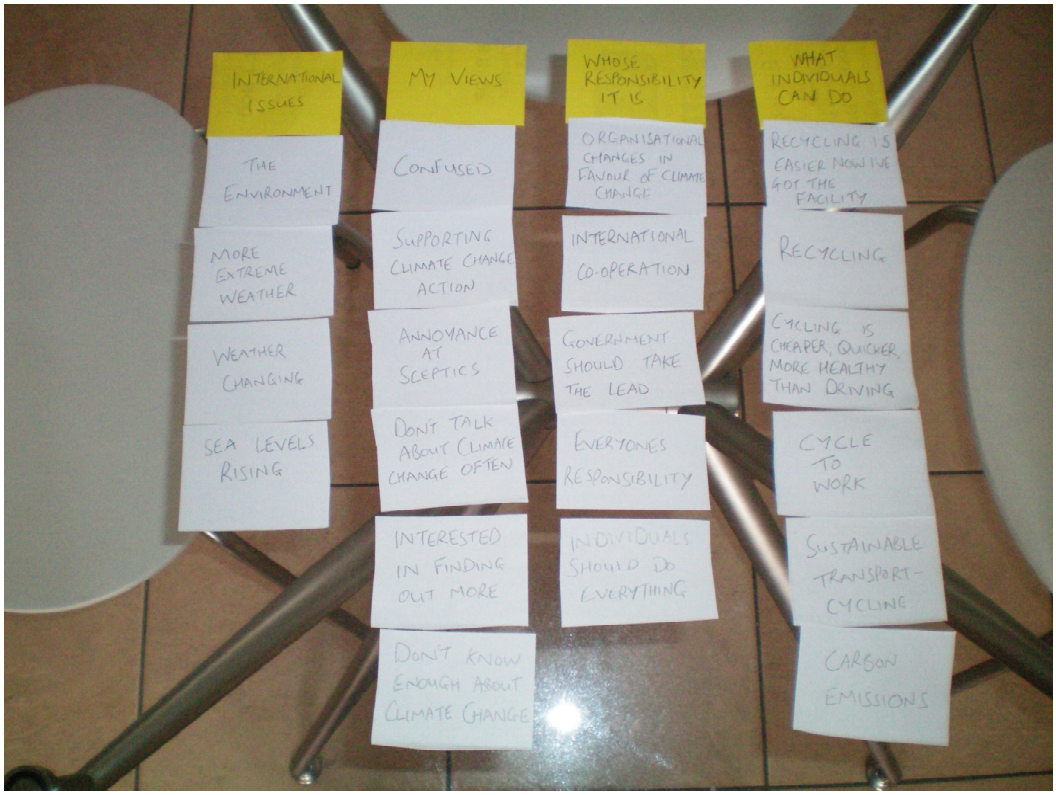
- What do people who have taken part in attitude-change interventions know about climate change?
- How is this information organised?
- Does 3CM clarify participants' understanding of climate change?
- Do individuals who took part in different attitude-change interventions have different cognitive maps of climate change?

Conceptual Content Cognitive Mapping (3CM)

- Technique developed by Austin (1994) and Kearney & Kaplan (1997)
- Data collection produces a visual display of each participant's knowledge structure
- 'Open-ended' implementation is good for in-depth studies with small sample sizes
- 'Structured' implementation also possible
- Been used to study various subjects in the past
- Benefits to participants
  - Clarifies understanding
  - Facilitates cognitive clarity

Data collection

- *N* = 20, ten people who had taken part in the interventions carried out by each case study
  - 11 female, 9 male
  - Average age 45: youngest 27; oldest 71
- Standard 3CM opening question
- Stern's (2000) framework of ESB used to probe 'attitudes'
- List of concepts used by others offered to participants based on an exploratory study
- Followed by semi-structured interview questions about the interventions



Data collection

- *N* = 20, ten people who had taken part in the interventions carried out by each case study
  - 11 female, 9 male
  - Average age 45: youngest 27; oldest 71
- Standard 3CM opening question
- Stern's (2000) framework of ESB used to probe 'attitudes'
- List of concepts used by others offered to participants based on an exploratory study
- Followed by semi-structured interview questions about the interventions

Interviews – descriptive statistics

	Total	Mean	Range
Interview length (mins)	-	45	30-70
Concepts	557	27.85	21-37
Categories	93	4.65	3-6
Concepts per category	-	5.99	1-12

- 8 participants added concepts from the list generated during exploratory study
- Post-interview questions on 1 to 5 scales
  - 3CM task clarified participants' understanding, Mean = 3.2
  - 3CM task expressed participants' thoughts well, Mean = 4.5

Analysis methodology

- Followed Irvine's (1997) approach for analysing open-ended 3CM data
- Category labels combined into major themes, based on label and content
  - Major theme most prevalent was chosen if category reflected multiple themes
  - If two themes equal, category label was reviewed
- All concepts placed into major themes
- Iterative discussion with two other researchers

Major themes in participants' cognitive maps

Theme	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Impacts	**	**	*	*	*		*	**	*	**	**	*	*	*		*	*	*	**	*	24
Mitigation	**		*	*	**	**	*	*	*	*	**	*	*	*	*	*	**	**		*	24
Information	*	*		*			*		*			*	*	*	*	**			*		12
Causes			*						*							*				*	4
Responsibility			*	*	*		*	*	*		*	*		*	*	*	*		*	*	14
Views & Feelings		**	*	*		***		*	*						*			*	*		12
Other				*									*				*				3

Interim findings

- Cognitive maps very rich
- 'Impacts' and 'mitigation' themes most prevalent
- Some people are sceptical
- None of the respondents mentioned adaptation to climate change
- 3CM is an appropriate research tool for research into perceptions of climate change

Next steps

Identify 'representative concepts'

- Could be used to supply concepts for a structured 3CM
- Hierarchical cluster analysis (Kearney et al, 1999)
  - Used to explore the participants' knowledge structures quantitatively
  - Look at differences between participants who were subjected to different attitude-change interventions

References

Austin, D.E., 1994. Incorporating cognitive theory into environmental policymaking. *The Environmental Professional*, 16, 262-274

Irvine, K.N., 1997. *Stewardship in the management of private forests: some psychological dimensions*. Unpublished MSc thesis, University of Michigan

Kearney, A.R., Bradley, G., Kaplan, R. & Kaplan, S., 1999. Stakeholder Perspectives on Appropriate Forest Management in the Pacific Northwest. *Forest Science*, 45 (1), 62-73

Kearney, A.R. & Kaplan, S., 1997. Toward a methodology for the measurement of knowledge structures of ordinary people: the conceptual content cognitive map. *Environment and Behaviour*, 29 (5), 579-617

Mandler, G., 1975. Memory storage and retrieval: some limits on the research of attention and consciousness. *In*: P.M. Rabbitt & S. Dornic, Eds. *Attention and performance*, vol. 5. London: Academic

Stern, P.C., 2000. Towards a coherent theory of environmentally significant behaviour. *Journal of Social Issues*, 56 (3), 407-424

Institute of Energy and Sustainable Development

Contact details and acknowledgements

Email: twhite@dmu.ac.uk

www.iesd.dmu.ac.uk

Many thanks to Dr Rob Wall and Dr Kate Irvine

This research is funded by the Engineering and Physical Sciences Research Council (EPSRC)

White, T. & Wall, R., in press. National, regional and local attitudes towards climate change: identifying appropriate target audiences for communications. *Local Environment.*

Institute of Energy and Sustainable Development

Appendix 5: Copy of paper published in Local Environment, October 2008